VOL. LII.] ESTABLISHED BY EDWARD L. YOUMANS. [No. 3.

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APPLETONS' POPULAR SCIENCE MONTHLY.

JANUARY, 1898.

EDITED BY WILLIAM JAY YOUMANS.

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NEW YORK:
D. APPLETON AND COMPANY,
72 FIFTH AVENUE.

SINGLE NUMBER, 50 CENTS. YEARLY SUBSCRIPTION, $5.00.

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APPLETONS' POPULAR SCIENCE MONTHLY

EDITED BY
WILLIAM JAY YOUMANS

VOL. LII

NOVEMBER, 1897, TO APRIL, 1898

NEW YORK
D. APPLETON AND COMPANY
1898

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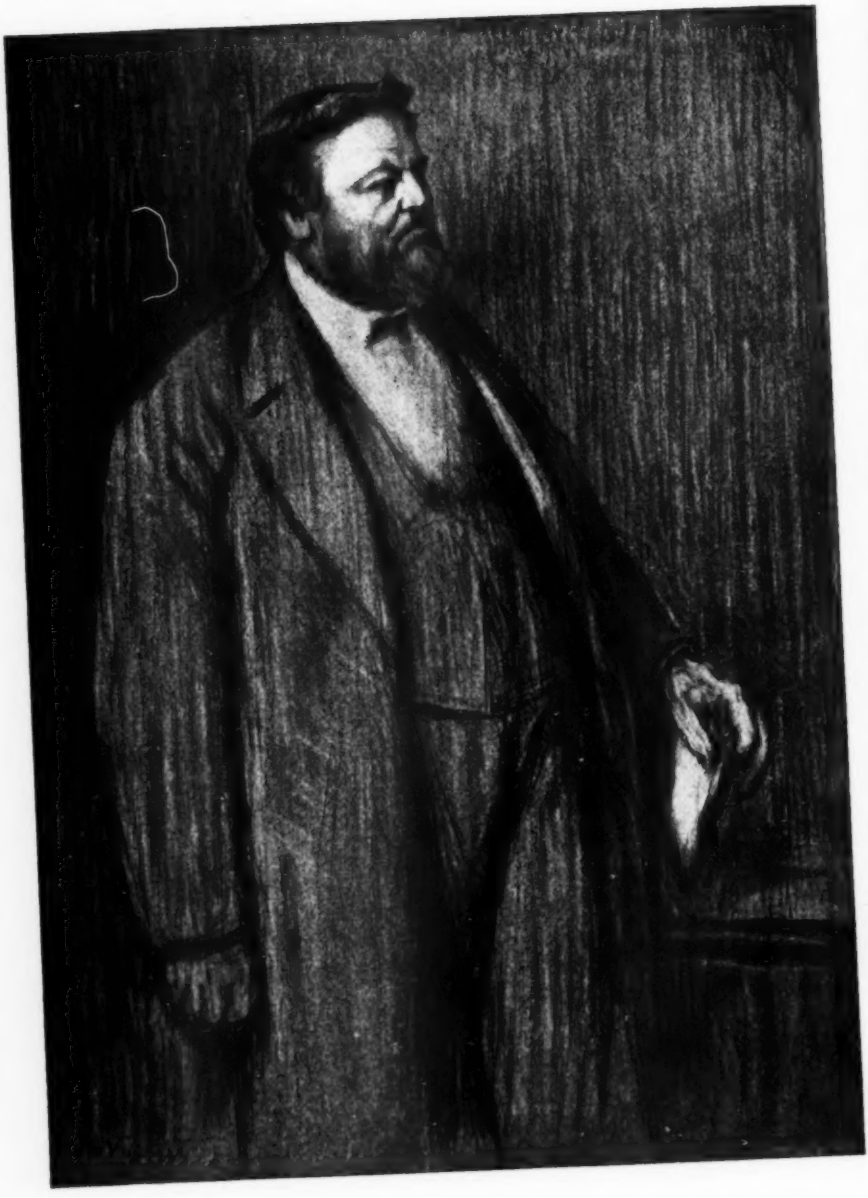

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APPLETONS'
POPULAR SCIENCE
MONTHLY.

NOVEMBER, 1897.

PRINCIPLES OF TAXATION.

By DAVID A. WELLS, LL.D., D.C.L.,
CORRESPONDANT DE L'INSTITUT DE FRANCE, ETC.

XII.—THE EXISTING METHODS OF TAXATION.

(*Continued from vol. li, page 776.*)

TAXATION OF PERSONAL PROPERTY.—Great, however, as may be the inequalities in the valuation and assessment of real property, those which obtain in respect to personal are so much greater as to almost preclude the idea of comparison.

In the incipient stages of society, when property consisted almost or quite exclusively of things tangible and visible—lands, buildings, slaves, horses, cattle, ships, household effects, and implements—when railroad shares, bonds and mortgages, certificates of deposit, and all the multifarious forms of credits and evidences of debt, by which we are enabled to-day to secure interests in land or in visible, tangible personal property in the possession of others, were absolutely unknown,* and when the rate of taxation was comparatively small, the theory under consideration was not impracticable in its application, and, under most circumstances, afforded but little opportunity for the working of injustice in respect to arbitrary discriminations in assessing. For when personal property was of a visible and tangible character there was no opportunity to conceal its ownership and to avoid the tax. Each member of the community furthermore took a sufficient interest in his neighbor's affairs to see that justice was done in this regard. This kind of friendly interest found

* Of the evidences of wealth owned by one of the richest families in the United States, almost the whole did not have an existence as recently as the year 1840.

expression in Rhode Island in a law that was passed in 1673, by which it was provided that, under certain circumstances, a citizen might be required "to give in writing what proportion of estate and strength in particular, he guesseth ten of his neighbors, nameing them in particular, hath in estate and strength to his estate and strength." It is only fair to add, however, that this law was intended to prevent tax-dodging, and only required a man to guess with respect to the relative size of his neighbors' estates to his own, when he himself was suspected of having undervalued his own estate. Very curiously this ancient law and practice find expression to this day in Rhode Island in the circumstance that no citizen of that State is qualified to vote upon any proposition to impose a tax, or for authorizing the expenditure of public money, that has not paid a personal property tax *six* days preceding such day of voting. Lists of persons who are or may be qualified to vote generally are published and placarded before election, with prefixes to each name, showing the electoral qualification of its representative on the list, whether the same is dependent on real estate or personal property taxation. Any person who shall take down or destroy this list once placarded is liable to a fine of three hundred dollars, or three months' imprisonment.

Then again very little of a citizen's property was situated without the territorial jurisdiction of the taxing power, or indeed without the territorial limits of the hamlet, town, or city in which the citizen lived. Then a man could not very conveniently live in one place and do business in another. Within a century an English court has declared a contract invalid which stipulated that one of the parties thereto should do an act in London and Oxford the same day, because the stipulation involved in this particular an impossibility. Now the distance involved could be traversed in about an hour. The nature of property, as well as the means for moving it, was also such as to render all transportation difficult, and rapid transportation impossible. The discrepancy in taxation as respects different places was also so small that no great advantage could be gained by shifting one's residence or property for the sake of evading taxation; and the difficulty and inconvenience of so doing were so great that the temptation could hardly have existed. But even in the most simple condition of society the practical application of what may be properly termed the "infinitesimal" system of taxation must have been always attended with great difficulties, for the reason that it involved and necessitated personal inquisitions, than which there is nothing in government that men more dislike and resist; and, in the language of a committee of the French National Assembly of 1789 (of which Talleyrand and Larochefoucald were members), the

recognition and practice of which, by any government is something inconsistent with, and antagonistic to, the maintenance of a free people.

It is not generally known, furthermore, that Alexander Hamilton, as a member of the conventions which framed the Constitution of the United States and the first Constitution of New York, gave all his influence in favor of the restriction of all internal or local taxation to visible, tangible objects, and to the assessment of these specifically, and by some uniform and simple rule. The language used by him in one of his papers (The Constitutionalist) on this subject is as follows: "The genius of liberty reprobates everything arbitrary or discretionary in taxation. It exacts that every man, by a definite and general rule, should know what proportion of his property the State demands. Whatever liberty we may boast in theory, it can not exist in fact while (arbitrary) assessments continue."

Again, had nothing come down to us in English history from the time of Edward III, other than one of the assessment rolls of that period (when there was little or no property capable of taxation but what was visible and tangible), the evidence would be complete that the mass of the English people were but little better than slaves; for the mere inspection of such rolls shows that their preparation involved such an inquisitorial scrutiny into domestic life, such a seeing, handling, enumeration, and minute valuation of everything in the household, from the utensils of the kitchen to the furniture of the bedchamber, as to make personal freedom, or a sense of self-respect, on the part of the taxpayer who submitted to such a scrutiny, almost an impossibility.*

And in this connection it is instructive to again refer to the famous insurrection of English yeomen and peasants under "Wat" the Tyler, in the reign of Richard II, the successor of Edward III, which originated directly in the attempt of a tax-gatherer or assessor to ascertain, by brutal personal examination, whether a daughter of "Wat's" had attained the age of puberty, and in consequence had so become liable to enrollment for capitation assessment.

But to whatever extent simplicity in the elements of property simplified the original methods and ideas in respect to local taxation, the problem involved rapidly changed, and became more and more intricate as increasing population, and increasing commerce, and in-

* A copy of an assessment roll of the time of Edward III (1329–'67) given by Lingard, in his History of England, contains a list of articles, down to a towel and a bench; and the historian notes that in the returns are carefully mentioned the very rooms in which the articles were found, and that there were no exemptions except one suit of clothes for each person, which were supposed to be included in the tax levied on the poll or person.

tercommunication, required that property should, to a great extent, be put into a condition to admit of being readily mobilized, in order to allow of its most profitable use and application. Thus a large part, in fact the larger part of what is to-day termed "personal property" in every civilized state, is of the most intangible character, and in great part invisible and incorporeal: such, for example, as negotiable instruments in the form of bills of exchange, state, municipal, and corporate bonds, and the multiplied forms of evidence of indebtedness, certificates of stocks, copyrights, patents, legal-tender notes, etc., all of which, if entitled to the name of property, is, through a great variety of circumstances, constantly exposed to fluctuations in value, frightful in amount, and incalculable in their suddenness, and under the influence of which wealth vanishes as if by the wave of a magician's wand. It is offset or measured by indebtedness which may never be the same one hour with another; is easy of transfer, and, as essential to using, is in fact continually transferred from one locality to another, and from the jurisdiction of one state to the jurisdiction and laws of another and a different state; is here to-day, gone to-morrow; is burned, sunk at sea, lost in mines, patents, railways, factories, trading associations, and in a thousand other different ways. It has been recently said that five men who do business in Boston can together control or dispose of an amount of property which equals one fifteenth of the entire assessed valuation of that city; and that they could, if they pleased, carry round the evidence of the existence of that property in their coat pockets, or, according to popular theory, the property itself.

For the purpose of ascertaining the amount of taxable personal property owned by individual citizens two methods have been employed in the United States:

1. In several States, such as Massachusetts, Connecticut, and Illinois, the taxpayer is required to give each year to the assessor a detailed and verified statement, carefully itemized, of all the personal property owned by him or under his control and of every kind, sort, and description. This method is generally known as "the listing system." In several of the States the principle that a State can only tax that which is within its territorial jurisdiction is ignored, and even visible tangible property situated outside of the taxing State is required to be returned for the purpose of taxation.

2. The other and more general method of ascertaining taxable personal estate is that which is exemplified in the State of New York, by which the assessor guesses at the personal property of the victim, and places him upon the list at such a figure as either his information

or imagination sustains him in considering to be that which justly represents the personal estate of the taxpayer.*

In view of the fact (made certain by all experience) that very few returns of personal property, even when supported by oaths, are worthy of implicit credence, the position of the assessor who honestly desires to enforce the law is one of great difficulty and embarrassment. For, in the absence of some superhuman power which will permit that to be seen which to ordinary vision is invisible, and to know what, through the exercise of ordinary reason, can not be known, any attempt on his part to obtain independent cognizance of such commercial and financial instrumentalities for the purpose of valuation and assessment is, on its face, an impossibility; and if the co-operation of the person to be assessed is to be invited or relied on, two of the most powerful influences that can control human action—love of gain, or the unwillingness to part with property, and the desire to avoid publicity in respect to one's private affairs—immediately unite to oppose and prevent such co-operation.

A resort to personal inquisition, with the accompanying machinery of oaths, "dooming," and penalties, is next in order; under which the State, ignoring all rules enacted for the protection of debtors in the ordinary collection of debts, pursues the citizen for the collection of what it claims to be a debt, with no better result, in nine cases out of ten, than the impairment of the public sense of both justice and morality.

But it is claimed that each individual owes the State annually a certain sum of money in the way of taxes, proportioned to his entire property. If he voluntarily pays, he escapes arbitrary measures. If he declines to pay, or tries to avoid payment, he has no just cause to complain if he is regarded in the light of a criminal, or if the same arbitrary measures are used to collect his tax as if it were a debt owing by one citizen to another. Let us examine this averment.

If the defaulting taxpayer is to be regarded as a criminal, and

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* "In a case involving the assessment of personal property, in one of the courts of this State a few years ago, an assessor in one of our cities testified that his method of ascertaining what personal property a taxpayer owned was to examine the directories, the county clerk's office, and papers relative to estates of deceased persons; and when he lacked definite information, to guess at the assessment from the place of business or of residence occupied by the taxpayer. If the tax was cheerfully paid for two or three years, the personal assessment would then be 'marked up.' This process of increasing the personal assessment went on until, as the witness graphically said, the taxpayer 'squealed,' when the amount was finally fixed at what the taxpayer would bear without swearing it off."—*Address on the Taxation of Personal Property, by Julien T. Davies, before the Manhattan Single Tax Club, January, 1891, New York.*

as such placed in the worst possible light, he certainly ought not to be deprived of the privileges of a criminal, which are a right to a public investigation according to the rules of evidence adopted by free and enlightened communities, a right to be heard before condemnation, and the right to be presumed innocent of having property subject to taxation until the fact is ascertained otherwise by legal proof. But under the existing tax laws of most of the United States there are not accorded to the taxpayer the privileges of a criminal; for no tax can be assessed on a large proportion of the personal property of the State according to any rules of legal evidence that any common law court would adopt. No assessor, under the laws of New York, for example, in assessing personal property, can act judicially. The law gives him no power to obtain legal testimony of a character that is admissible in court; he must act the part of an arbitrary despot against an inculpated taxpayer, or not act at all, and his conclusions for acting must be reached at best by the testimony of those who have no means of knowing anything, in a legal sense, about the subject-matter under investigation. It seems clear, therefore, that any attempt to tax without legal evidence is an act of usurpation or despotism, wholly antagonistic to the principles of a free government, and that it is a mockery to characterize such acts as, in any sense, judicial proceedings. Nor does the right to reduce or regulate the assessment by the oath of the taxpayer relieve the law, in any degree, of its unequal and despotic character; for every individual holding public office knows that oaths, as a guarantee of truth, in respect to official statements, have ceased to be of any value. The assessments made according to the oaths of parties, furthermore, are not made according to legal evidence, upon examination and proofs; but according to the will and secret caprice of each taxpayer, instigated by his selfishness and the natural depravity of human nature. Each taxpayer, under the present rule, becomes, therefore, the interpreter not only of the law but of the fact, and makes a secret interpretation of both, and we have as many interpreters of the law as there are numbers of taxpayers; and also an indefinite multiplicity of assessors; for each person who unfairly reduces his own assessment arbitrarily assesses thereby some other of the community for the difference. Could or would any people apply the same rules for the collection of debts? Is there any one who has so much confidence in human nature that he will propose a law that a person who is sued shall be discharged from all claims of indebtedness if he will make oath, interpreting both the law and the fact himself, that he owes the claimant nothing? Is it believed that under tariff laws the government could get sufficient revenue to pay for its collection if the importer was

permitted to offset debts against the value of his goods; or if the law was peremptory that his oath alone should be given, and that there should be no legal examination, inspection, or proof of the value or character of the importations?

In whatever aspect, therefore, we regard the present popular system of local taxation in the United States, it is arbitrary and in violation of the principles of constitutional government. If the assessor acts, he acts solely by his despotic will, and without any reference to legal proof or evidence, such as is enforced in recovering private debts; and if the taxpayer, by his oath, becomes the arbiter, his will is supreme and not subject to investigation or control. It is a system, in short, that violates all the laws of evidence, the growth of centuries in civilized countries; that makes secret that which should have publicity, and proceeds upon a basis that could not be recognized for one moment in the collection of debts, or in the trial of persons accused of the most heinous of offenses.

Such, then, are the difficulties which all experience has shown to be attendant upon every attempt to tax personal property of an intangible and invisible character, and which all who have investigated the subject acknowledge to be insuperable. As not a few, however, who are ready to make this acknowledgment nevertheless insist, that all personal property that is visible and tangible and can not be concealed, but can be reached effectively and equally, ought to be taxed; and as the drift of popular sentiment in the United States at the present time favors this assumption, it is important to next consider the nature and extent of the results attainable by intelligent and faithful assessors acting in conformity with it.

As the experience, however, of the States that have enacted the most precise and stringent methods of taxation proves beyond question, that the returns of the owners of visible, tangible personal property, even when supported by oaths, will not, as a rule, afford a basis for the correct valuation and assessment of such property, the further assumption is warranted, that the attainment of such a result in even an approximate degree must depend on the personal visitation and inspection of the most intelligent and honest assessors. And here at the very outset of the prospective investigation its inherent insuperable difficulties begin to manifest themselves.

Thus a large proportion of the so-called personal property of every highly civilized country which is *not* intangible and invisible, and which requires only ordinary perception for recognition and valuation, is in the nature of instruments or subjects of commerce between states and nations; such as railroad machinery, ships, steamboats, immense stocks of raw and manufactured products accumulated in store for the sole purpose of movement, or actually *in*

transitu. As a matter of fact the granaries for no small portion of the surplus stock of the world's cereals are at the present time ships and railroad cars in the process of movement to the points of greatest demand for consumption. What shall be the *situs* of all such things for assessment? If actual location is to be determinative, then a product of grain, or merchandise, which, in movement for a market, or conversion into other forms, may happen to be in Illinois in April, in Ohio or Massachusetts in May, in New York in July, in New Jersey in August, and in Connecticut in October, will be liable to five separate taxes in one and the same year; for the laws of each of these States require their assessors to return, for taxation, all such property as at the periods mentioned may be actually within the sovereignty and jurisdiction of the taxing authority.

If, therefore, the existing system of taxing visible and tangible personal property in the United States is to be continued and made equitable and effective, the first essential step for the purpose of making it such, by preventing evasions and avoiding duplicate taxation on one and the same persons and property, is for all the States to agree that all their assessors shall make their visitations, inspections, and appraisements for the purpose of assessment on one and the same day, as, for example, the first day of April. The following probable forecast of the result has been made by a recent writer:

"On the appointed day, all over the country, a swarm of assessors must besiege the factories, mills, shops, and stores for the purpose of making an honest valuation of all merchandise on hand. This valuation must be completed in one day; or otherwise Smith's valuation being completed on April 1st, while Jones is left to April 2d, there will be a midnight exodus of easily portable goods from Jones to Smith, so that one assessor shall find little of value in the possession of Jones on April 2d. No help must be asked in the work of valuation from the owners or clerks; for if that is done, the assessor might just as well accept the sworn returns of the owners, as is done now, with the most ludicrous and inequitous results. As it is evident also that it would be impossible for the owners themselves to make such a valuation in one day, even with the aid of all their clerks, there must be a number of assessors employed, exceeding all the number of persons employed in holding and selling merchandise. The work might, however, by extreme diligence be done in a rough way by two million local assessors. As it would take them at least three days to tabulate, copy, and file their returns, besides the one day occupied in valuing, each would serve at least for four days; and if paid at the rate necessary to procure men competent for the task, the lowest cost of such an assessment, independent of printing

and stationery, could not be properly estimated at less than forty million dollars.

"Again, on 'assessment day,' there would be universal concealment of all articles of small bulk and great value. Watches, jewels, gold, money of all kinds, and every like conceivable thing would vanish from sight. Men would walk about stuffed with valuables. Old stoves, pots, and pans would be filled with money and jewels. Valuable goods which could not be hidden would be covered with dust or otherwise made to look almost worthless. In every mill and factory manufactures would be kept in an unfinished state, as far as possible, until assessment day had passed. A thousand devices would be resorted to in order to reduce the apparent value of the things which the assessor would inspect, or to prevent him from seeing them at all.

"In order to make this plan of official valuations successful, the assessors must enter every room in every house and strip naked every man and woman whom they suspect of concealing taxable property. This is the only way in which visible, tangible personal property ever was or ever can be fairly, equally, and effectually taxed.

"And, when all this was done, the system would none the less fail. It could not be made even approximately correct. Every article would be valued very much too high or very much too low. Nor would the average produce any fair result. The goods of Jones would be appraised at two hundred per cent of their real value; the goods of Smith at ninety per cent; and the goods of Brown at fifty per cent. Jones would thus be cheated heavily, and of Smith moderately, for the sole benefit of Brown." *

On the other hand, if the fiction of law, that personal property follows the owner, is to govern, then all such property may be taxed *where it is not*, and be exempt from taxation in the place *where it actually is*, and where it shares in the benefits that flow from the protective expenditures—police, fire department, etc.—which are incident and necessary to the locality. Or, as is very often and perhaps most usually the case, the same property is subjected to double taxation; and as a proof that this latter supposition, which seems on its face an absurdity, is a matter of constant experience, it may be mentioned that some years since, and probably at the present time, a well-known publishing house was regularly taxed in Cambridge, Mass., for so much of its stock in trade as was kept in store and permanently employed in business in New York city, although it was admitted that the same tangible, visible property

* Taxation of Personal Property, Impracticable, Unequal, and Unjust. By Thomas S. Shearman. New York, 1895.

was at the same time regularly taxed by the New York authorities; and, furthermore, when a protest was made to the Massachusetts authorities against the continuance of this injustice, the decision was rendered, that under existing Massachusetts statutes the plundered taxpayer could have no remedy except by change of business or change of (State) residence.

Again, if a foreign banker subscribes to any of the State or municipal loans of the United States, the bonds or other evidences of indebtedness which he receives in exchange for his money are exempt from taxation by reason of his nonresidence; but if a *resident* widow or maimed soldier be moved by the desire for security to purchase a little of the same loan, the small rate of interest which such investments generally carry will be made still smaller to all such persons, by reason of an annual tax of from one to two or a greater percentage imposed on the holders, for the simple reason that they are residents; although the protection afforded to the latter is in no degree different from or greater than that afforded to their more fortunate and rival foreign competitors, who reside where such taxes are not imposed; all of which is equivalent to saying officially that whenever an American loan, particularly desirable for trust investments, is created, it shall be sacredly reserved for foreigners, or that bad portion of citizens of the United States who have no scruples about cheating the assessors. Local subscriptions to local indebtedness, with the augmentation of interest in the locality which would necessarily follow, are therefore discouraged; while to the American citizen who ventures to subscribe, residence is made an offense and coupled with a penalty.

In the case of agriculturists, who constitute more than half the population of the country who follow gainful occupations, their personal property, consisting mainly of farm animals, implements, and farm products, is always readily open for inspection, and has a nearly uniform value throughout the country. The personal property of farmers is accordingly more completely reached and more accurately valued by honest assessors, than the property of any other class of the population.

Consider next the case of merchants. "What assessor, however honest and competent, can personally value all the stock of even one store, not to say the stock of all the stores in his district? Fancy an assessor making a personal appraisal of the stock of fifty drug stores, a hundred dry-goods stores, and as many groceries! In one store there are hundreds of different articles at different prices, by the yard, or the pound, or the gallon. Bales of goods lie side by side; some worth four cents a yard, some ten cents, some two dollars. The difference between goods worth one dollar a yard and those worth

two dollars is often imperceptible to the eye of any one but at expert. But how can an assessor have time even to open all these bales, to look at them, much less judge accurately of their value? All the assessors of New York city could not approximately value the stock of one of its great dry-goods merchants without relying upon the word of their clerks. Therefore the stock of merchants and manufacturers would be assessed upon the valuation given by themselves, as in fact it is now. Thus the assessment of 'visible and tangible property,' in these important cases, is made and must be made in exactly the same manner as the assessment of bonds, notes, and other *invisible* property, resulting in a double or treble burden upon the simple and truthful as compared with their unscrupulous neighbors."

And, finally, as regards so much of other "personal property" as is tangible and visible, and clearly within the territorial jurisdiction of the taxing power, such as articles of personal adornment, clothing, furniture, works of art, musical instruments, books, etc., shall we assume that we have here a class of articles on which it is desirable to levy taxes? Of course, the popular answer will be in the affirmative; for are not all these objects, it may be asked, the very ones best fitted to sustain taxation? and are they not in great part luxuries rather than necessaries? But how, it may be asked, are you going to tax them? for it is reasonable to suppose that if they are to be taxed, it is to be by a system that works equitably, and not by a system which, by taxing A, and letting B, C, and D escape, brings the law into contempt; and, by making the sense of the commission of a wrong on the part of the State the excuse for the commission of another wrong on the part of the individual, gradually undermines the morality of a community that does not wish to be dishonest.

An even approximately correct valuation of the above-enumerated articles is, however, a matter of great difficulty, and none but an expert can effect it. In very many houses there are many articles, like bedding, carpets, pictures, glass, porcelain, and the like, which exhibit few outward indications of undue value, and yet whose cost was very many times greater than similar articles in ordinary use. In fact, in proportion to the wealth of the taxpayer would be the failure of the most honest assessor to estimate the true value of his property. Some years ago a State tax commission in Illinois, with a view of aiding assessors to discover and rightly assess property of the character under consideration, recommended to the State Legislature the enactment of a statute whereby every woman of "full age and sound mind," either directly or by her representative, should annually return to the assessors a statement of the value of all the jewelry, household furniture, and all other property in her possession; but these recommendations never re-

ceived any higher consideration from the public than that of being denounced and laughed at. And most naturally; for what woman would tell her age or the amount and value of her jewelry and finery, and more especially to a stranger invested with brief official authority as an inquisitor and assessor?

Again, a very large part of what is termed "personal property" is, through the necessities, policy, or organization of governments, made exempt from taxation; as, for example, all instrumentalities and property of a government—national, State, or municipal—especially the bonds, notes, currency, and certificates of indebtedness issued by the United States. The several States also generally exempt or lightly tax the deposits and surplus of savings banks, the accumulations of mutual insurance companies, the property of charitable, religious, or educational organizations, and also a comparatively small amount—but large in the aggregate—of personal property in the form of household furniture, clothing, working tools, vehicles, and animals, and the produce of farms not sold but consumed by the producers; and that the present tendency of State legislation is furthermore to continually enlarge the list of exempt property. The aggregate money value of such exemptions can not be accurately stated, but there is reason to believe that they include about one fifth of all the personal property of the United States.*

TAXATION OF THE INSTRUMENTALITIES OF COMMERCE.—Extensive as has been the foregoing review of the inherent difficulties attendant on the attempt to equitably and efficiently tax personal property, the results of taxing the instrumentalities or objects of commerce are especially worthy of additional notice in this connection.

A little reflection ought to abundantly satisfy that to tax the instrumentalities or objects of commerce in one locality, and to exempt the same from all direct taxation in another, will clearly not permit the former to enter a common market on an equal basis for competition with the latter. And yet this unjust discrimination is exactly what does result from the attempt of a majority of the States of the Federal Union to tax all such instrumentalities or

* The New Jersey State Board of Taxation, in their annual report for 1895, call attention to the fact that, out of the total amount of assessed property in that State in 1894, nearly ten per cent, or $72,786,571, was exempt from taxation. The amount of tax exemptions in Newark, N. J. (a city which within recent years has been nearly bankrupt by excessive indebtedness and taxation), is reported for 1897 at $18,076,568, made up in part as follows: Churches, $4,081,750; private schools, $196,900; city property, $4,924,950; cemeteries, $893,800; charitable institutions, $1,231,700; public parks, $4,654,867. Soldiers' and sailors' widows have exemption to the amount of $523,675; firemen, $79,445; the National Guard, $36,475. These figures do not include the railroad exemptions, which are under the charge of the State Tax Commissioners.

objects under the general head of personal property, and the exemption of the same classes of property from any corresponding assessment in the British provinces of North America, and in all foreign countries with which the United States enter into extensive commercial intercourse and competition. Boards of trade and commercial conventions may pass "deploring" resolutions concerning the decay of American commerce, and committees of Congress may continue to investigate the same subject, but so long as ships, engaged in the carrying trade on the *free ocean*, and owned in Canada, England, France, Germany, and Holland, are not directly taxed, and ships engaged in competition in the same business, and owned in Portland, Boston, Baltimore, New Orleans, and San Francisco, are taxed, and taxed heavily, commerce will incline to move in the paths which are made easy and profitable to it. The difference in cost of a single penny per bushel in laying down grain at Liverpool may alone be determinative of the question whether millions of bushels shall be supplied by the wheat fields of the United States or those of Russia, India, or Hungary.

"As a rule, the States of the Federal Union tax shipping as other property is taxed, regardless of the fact that the other leading maritime nations usually impose no taxes on shipping as property, but tax only the actual earning of shipping; assuming doubtless, and correctly, that from the very nature of its use shipping can not fairly share in the benefits which accrue from state and municipal taxation for public purposes. In short, when a vessel is fulfilling the function for which it is built, it is navigating the ocean, remote, except during brief stay in port, from the fields and purposes to which state and local taxes are applied."

Only one State—Delaware—exempts shipping from all taxation; New York and Alabama exempt so much of their shipping as is engaged in foreign trade; Massachusetts, New Hampshire, and Connecticut tax the earnings only of their shipping in foreign trade; and, under decision of the United States Supreme Court, Pennsylvania imposes no tax on its shipping in interstate or foreign trade.

All the other States tax all classes of vessels as personal property, making no distinction between those engaged in foreign and domestic trade.

The comparative burden of taxation on shipping in the United States and the maritime states of Europe finds practical illustration in the following examples: The city of Portland, Maine, levied more taxes in the year 1893 on its shipping (63,206 tons, valued at $909,000) than the Cunard Company paid to Great Britain in the same year on a valuation of their ships of nearly $9,000,000. The taxation of shipping at Charleston, S. C., is five times heavier than that

levied by Great Britain or Germany. During the year 1893 the city of San Francisco levied taxes to the amount of $85,675 on its shipping, a sum within $600 of the combined taxes paid during the same year by the Cunard Line, the Hamburg-American Line, the North German Lloyd, and the Compagnie Générale Transatlantique of France to their respective Governments; their combined shipping comprising upward of 700,000 tons of the best steel and iron steamships valued at upward of $58,000,000. And in addition to this onerous and (in comparison with other countries) discriminating burden of taxation or shipping, the income-tax act of 1894 imposed an additional and new tax of two per cent on the earnings of shipping in excess of $4,000, which would have fallen mainly on that portion of the United States merchant marine—i. e., the great American steamships—which is most exposed to foreign competition, and which it is regarded as especially desirable to nationally foster.

On the other hand, Great Britain, Germany, France, and the Netherlands tax only the earnings of shipping—i. e., an income tax. Austria in 1894 suspended for five years all taxation of its vessels engaged in foreign trade. Under this system of vessel taxation by the great maritime countries of Europe it is, furthermore, to be noted that the ownership of a ship that is idle and not earning does not entail any burden of taxation; but in the United States it makes no difference whether a ship be at work or idle, profitably or unprofitably employed, she pays taxes all the same.

The experience of the several States in respect to the taxation of vessels affords, however, a very striking illustration of the facility with which obnoxious taxes are evaded in the United States, or shifted upon those who are less able to bear them, and is thus related in the Report of the United States Commissioner of Navigation for 1894: "It is relatively an easy matter for the owner of several vessels to form a partnership with the resident of another State in which low taxes are imposed on shipping, and by allowing the vessels to stand in the name of such partner to escape the endeavor of the law to tax him more than his competitors in navigation are taxed. Thus, some years since, the authorities in Chicago decided to tax the shipping owned at that port on its full insurable value at the rate fixed for municipal taxes. The vessel owners of the city, in self-defense and to enable them to continue in business against competing ports, were compelled to make nominal transfers of their property, and thousands of tons of shipping, doubtless owned in Chicago, appear on the records of the National Bureau of Navigation as owned in other States. Though in the number and tonnage of its entries and clearances Chicago ranks with the greatest ports

of the maritime world, yet its apparent rank as a ship-owning port is insignificant."

It is important also to notice how changes in the methods of doing business, in the facilities for transporting persons and property, and in the constitution of society and standards of morality, antagonize and nullify the popular ideas concerning taxation of personal property.

Formerly (as has been already pointed out) a man could not conveniently live in one place and carry on business in another. But now men may live and be taxed at places where the taxes are light and do business every day in a city twenty, thirty, or fifty miles distant where taxes are high, and there be exempt from all taxation. And yet how are you going to prevent a citizen from deciding for himself where he will live and where, under the accepted fiction of law that personal property follows the owner, his personal property shall be taxed? Formerly, to bargain for the sale of goods in a place not farther removed than New York is from Boston or Philadelphia, transport them there, and receive the proceeds of the sale, was an affair of weeks. Now a man living in Boston may bargain for a sale of thousands of dollars worth of goods in New York, transport them there, and receive his pay in the space of a single day. Nay, more. A man may acquire property and part with it at places on the opposite side of the globe with the greatest ease and security within the space of a few hours.

A change in the standards of morality has been alluded to as antagonizing methods of taxation. Thus, not very many years ago, every man knew, at least approximately, the amount and kind of property of all his neighbors, and knew that his neighbors knew the same in respect to himself. "He was willing to admit, under oath or otherwise, what everybody knew; and he would hardly dare to drive six cows to pasture every morning and swear in the afternoon that he had none." But now let us see from an indisputable experience of very recent date how the conditions of property and of morals have changed. Previous to January 1, 1889, the State of Connecticut, in accordance with common practice, taxed personal property in the form of bonds and notes from one to two or more per cent, wherever it could be found. The result was that the State from the outset could never reach for assessment but a small fraction of such property, although every citizen was required to annually submit a list to the assessors and make oath that he had included in it all property of the character in question; and this fraction, furthermore, tended to rapidly decrease. Thus, in the so-called grand list or aggregate valuation of the State for the year 1855, the value of the notes, bonds, and money at interest made subject to assessment constituted about ten per cent of

the entire taxable property of the State. In 1865 it was about seven and one half per cent; in 1875 a little over five per cent, and in 1885 about three and three quarters per cent; and yet during the period covered by these statistics it is probable that the amount of State, railroad, municipal, and farm-mortgage bonds owned by the citizens of Connecticut increased to an extent equal to at least one half the valuation of all the other property in the State returned and made subject to taxation. In 1855 the inhabitants of eighty-one towns of the State did not own a single mortgage bond. Not a bond was returned as owned in the rich city of Meriden. The twenty thousand inhabitants of the thriving city of Waterbury by their united efforts managed to scrape together only seven hundred and fifty dollars in bonds. So far as cash is concerned, there was never a community since mankind emerged from a state of barter that got along with so little. In 1889, however, the Legislature of Connecticut modified her former statutes, and provided that the owners of all notes and bonds who would register them with the State Treasurer, and agree to pay in advance a tax of one fifth of one per cent per annum for a period of five years, should be exempted from all further State or local taxation on the same. Note now the results. The law in question went into operation on the 1st of August, 1889, and between that date and the 1st of January succeeding, something over $30,000,000 of bonds and notes were registered under the modified assessment,* of which the treasurer in his report to the Legislature says, "Probably at least three fourths have never paid any taxes whatsoever." Here, then, within five months was uncovered to the taxing power a quantity of what the law makes property in excess of $22,000,000, and returns are still being received in large volume. The conclusion, therefore, seems to be that there is a good deal of conscience in the highly moral State of Connecticut which can be induced to cheat an forswear on a two-per-cent tax, that can not be bribed on a tax of one fifth of one per cent; or that a tax of from one to two per cent on bonds and notes in Connecticut is sufficient to nearly tax out of existence all conscientious scruples of its people in respect to the violation of law and the perpetration of fraud in respect to matters of taxation.†

* For succeeding years the amounts registered with the State Treasurer were returned as follows: 1890, $33,654,335; 1891, $24,792,509; 1892, $39,473,988; 1893, $12,418,673; 1894, $20,507,396; 1895, $18,533,543; 1896, $21,159,161. Why the large difference in the receipts of the above years occurred has not been satisfactorily accounted for by the State officials.

† In 1897 the Legislature of Connecticut, not satisfied with the unexpected large amount of notes and bonds returned for taxation at the rate of one fifth of one per centum per annum when voluntarily paid in advance, doubled the rate of tax to two fifths

In view of these facts the following answer, made some years ago by a man of New England birth and education, but of unenviable character and influence, to a question as to his father's honesty, has no little of point and application: "He is honest as the world goes. He won't tell a lie for twelve and a half cents" (the New England ninepence), "but he will tell eight for a dollar."

SEMON'S SCIENTIFIC RESEARCHES IN AUSTRALIA.

By Prof. E. P. EVANS.

SOME years ago Dr. Paul von Ritter gave to the University of Jena a considerable fund for the endowment of research in the direction of the doctrine of evolution, and more especially for promoting the scientific exploration of Australia. The complete geographical or physical isolation of this vast island since the Tertiary period has prevented it from keeping pace with other portions of the globe in the development of animal life, and it has therefore been very aptly termed "the land of living fossils and of missing links," on account of the peculiarly primitive character of its fauna. It is evident that the oöticoids or semi-oviparous mammals, whose young are born as embryos and then hatched in the mother's pouch, would be at an immense disadvantage with the viviparous mammals in the struggle for existence. For this reason the marsupials and monotremes have been gradually supplanted by the more highly organized placentals wherever they have encountered each other in vital competition. The study of fossils shows very clearly how this process went on from age to age until it resulted in

Old Tom.

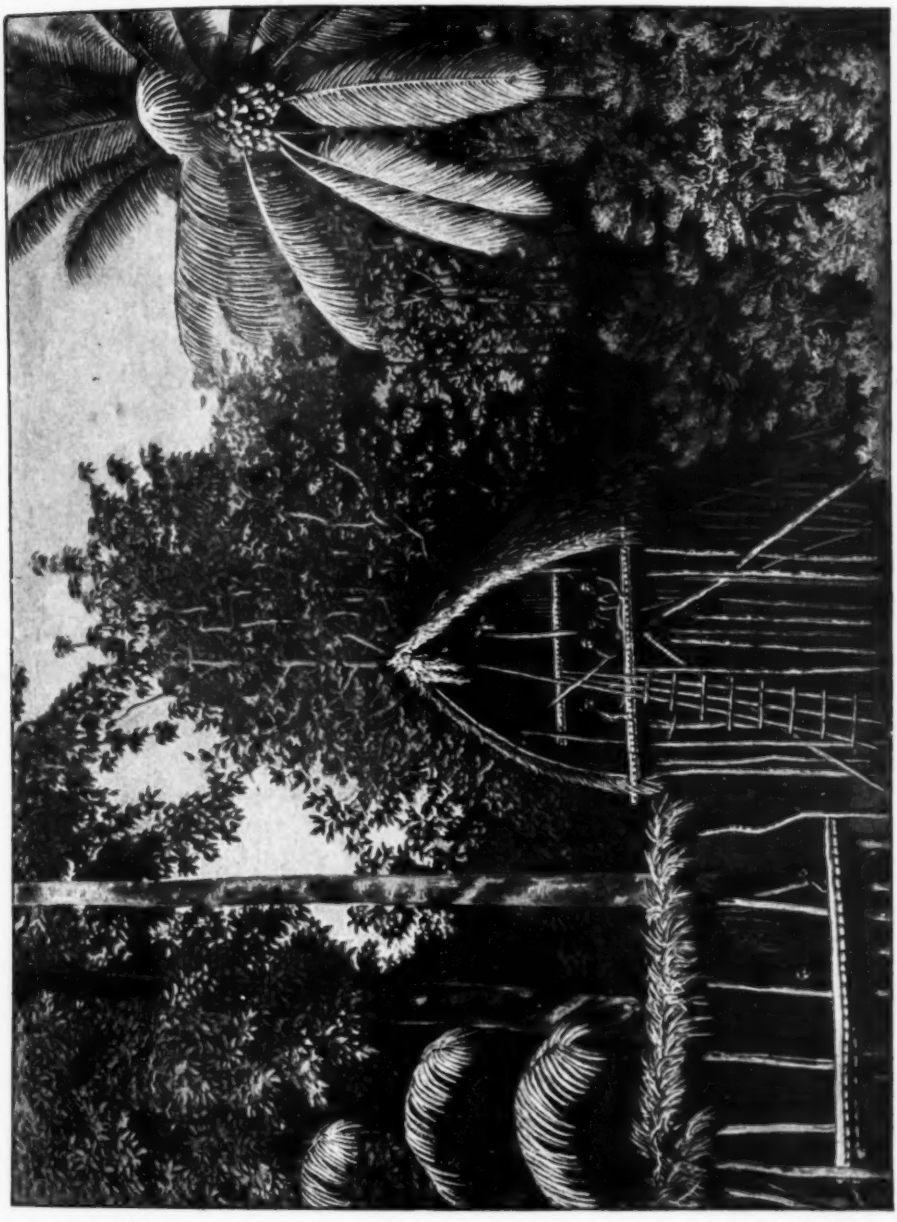
of one per cent, or four mills on the dollar. What will be the result of this fiscal policy is yet to be determined; but it is to be regretted that the original experiment could not have been longer continued.

the Miocene period in the complete supremacy of the placentals and the almost utter extinction of the marsupials in the principal regions of the earth. Of the latter class of animals, the didelphys of the western hemisphere, of which the American opossum is the best-known species, is the sole survival outside of Australia. This is owing to the fact that all the other continents have been more or less closely connected by land during long geological epochs. This is still the case with Europe, Asia, and Africa; even the dividing basin of the Mediterranean is of relatively recent origin, as may be clearly shown by a comparison of the fauna of its northern and southern shores. Also the extreme northern points of America and Asia, although previously separated, were subsequently united for a long time, beginning with the latter half of the Tertiary period and extending into the Pleistocene age, when the species of mammals now prevailing in both hemispheres were already existent. It is therefore perfectly intelligible that, under these circumstances, Australia and the adjacent groups of islands should be of special interest to the naturalist as fields of investigation; for there he can study living specimens of mammals, birds, fishes, and reptiles of which he finds elsewhere only the petrified remains.

It was with this object in view and with the pecuniary aid derived from the Ritter endowment fund that Dr. Richard Semon, a former pupil of Ernst Haeckel, and now professor of anatomy and zoölogy in the University of Jena, landed at Adelaide in the midsummer of 1891, and pitched his camp in the Burnett district of the Australian bush, at first on the banks of the Boyne River. He engaged as companion and general conductor of the expedition a German immigrant named Dahlke, whose family had left their fatherland when he was only four years old, and who had grown up into a thorough Australian. This man furnished a dray and five horses as the most convenient means of conveyance, and secured the services of eight families of aborigines, consisting in all of about thirty persons, men, women, and children, whose business it was to catch fish and search the dense Australian scrub for specimens of its fauna.

In order to stimulate the activity of the natives, Semon offered prizes for the capture of particularly desirable animals, and also promised to pay their regular wages at the end of every week; but a single experience of the results attending the latter part of this arrangement sufficed to prove its utter impracticability; for no sooner did they find themselves with cash in hand on Saturday evening than they procured several bottles of rum from a liquor shop kept by an Irish woman several miles distant, and on Sunday morning were all dead drunk. In order to prevent a repetition of this booz-

ing bout, an account was henceforth kept, and the cash system abolished. After the lapse of nearly three months the natives grew



A Marra (Bachelors' Home) in Pinupaka.

tired of this regular employment, as they invariably do, and the whole "mob" suddenly quit work, received their wages and special awards, and went back very cheerfully to the primitive vagrant life

of the bush. The term "mob," by which the tribe has learned to designate itself, is etymologically quite appropriate, since it would be difficult to find a race more *mobile*, unstable, and incapable of persistent effort in one direction than the so-called Negritos. With spears, clubs, and boomerangs they easily kill game enough for food; a few broad strips of bark set up in the form of a tent afford all the shelter they desire, and unless they prefer to go naked, as their an-

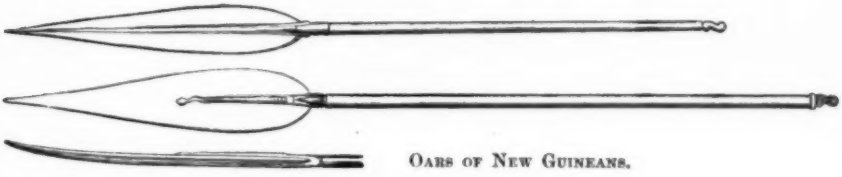
MEN OF AROMA.

cestors were wont to do, the tattered remnants of the squatters' cast-off clothes supply them with all the raiment they want. Semon confesses a certain admiration for this inborn love of freedom and strong sense of independence, which they prize more highly than what we call the conveniences and comforts of life, although this unthrifty spirit of primeval savagery often seriously interfered with his plans, and in general presents an almost insuperable obstacle

to every effort to educate and civilize them. Several of these natives soon returned, and among them "Old Jimmy," whom he learned to esteem as "the best and most faithful of assistants"; he afterward had many other Australian and Papuan aborigines in his service, and, through daily intercourse with them, became thoroughly acquainted with their habits of life, racial peculiarities, tribal organization, religious ideas, and superstitions.

MACKENZIE.

After carrying on his explorations with remarkable success for nearly a year and a half in Australia, New Guinea, and the Moluccas, Professor Semon returned home *via* Java and India in the spring of 1893. The strictly scientific results of his researches during this period are now being published with the aid of several collaborators in a serial work entitled *Zoologische Forschungsreisen in Australien und dem Malayischen Archipel* (Jena: Gustav Fischer), and to be completed in some twenty-six numbers, of which six have already appeared. Meanwhile, he has given to the public a more comprehensive and popular record of his experiences and observations in a single volume, containing a mass of most interesting facts and reflections, and written in an exceedingly lucid and lively style (*Im australischen Busch und an den Küsten des Korallenmeeres.* Mit 85 Abbildungen und 4 Karten. Leipzig: Engelmann, 1896. Pp. xvi, 569. Price, 15 marks). We may add that the collection



OARS OF NEW GUINEANS.

of specimens made by Professor Semon is so extensive and extremely characteristic as to render the Zoölogical Museum in Jena the very best place in the world for studying the natural history of the regions he explored. Indeed, it is so unique that not long since an Australian zoölogist came to the picturesque university town on the Saale for the purpose of examining one of the fauna of his native land.

In the present paper we shall not attempt to follow the author step by step in all his wanderings, nor to give even a *résumé* of his zoölogical studies. The reader will find in his book reliable and very readable accounts of the phascolarctos, the duckbill, the porcupine ant-eater, the bandicoot, the dasyure, the wombat, the various kinds of kangaroos and other marsupials, the bower bird, the bird of paradise, the cockatoo, the hornbill, and similar species remarkable for

AUSTRALIAN WEAPONS AND UTENSILS. 1 and 2, boomerangs; 3, stone hatchet; 4, wooden shield; 5, reed basket; 6 and 7, wooden clubs. (1–4, 6, 7, from Burnett; 5, from Cooktown.)

their strange forms and gorgeous feathers, and the multitude of gigantic lizards, death adders, and other venomous reptiles, and the huge but harmless python known as the carpet snake. There are also vivid descriptions of the natural scenery, as well as of the natural history of this marvelous land, in which the mammals lay eggs, the cuckoos resemble pheasants, the hoot of the owl sounds

UTENSILS AND ORNAMENTS FROM SOUTHEASTERN NEW GUINEA. Those marked with a * come from the Trobriand Islands. 1–16, wooden knives used in chewing betel; 17–19, knives of cassowary bones; 20–29, 31, necklaces and bracelets (20–23, 25, 26, of snail shells; 27, of dog's teeth; 28, 29, 31, of braid; 24, man's lower jaw as bracelet); 30, braided finger ring; 32, 33, vessels for limewater; 35, 36, wooden bowls for pounding betel; 34, mussel shell as ornament for the brow; 37, bamboo knife for cutting off heads; 38, mussel shells as coin; 39, 40, combs; 41–44, headdresses of birds' feathers (41, feathers of parrots; 42, 44, feathers of birds of paradise; 43, feathers of cassowary and tail of marsupial).

like the note of the cuckoo, and the fish have lungs as well as gills. Professor Semon was especially interested in a species of this queer fish known as *Ceratodus forsteri*, which in early geological periods inhabited the waters of the whole globe, but is now confined to the Burnett and Mary Rivers in Queensland. As the result of his studies he corrects many current errors concerning its supposed amphibious character, and explains the real functions of its lungs in times of drought, and the advantages they afford in the struggle for existence over fishes which depend solely upon branchial respiration for the oxygenation of the blood. Owing to its close affinity with the *Protopterus annectens* of tropical Africa, many habits of the latter have been falsely ascribed to it, such as burying itself in a sort of cocoon of slime during the dry season until the rain dissolves this incasement and wakens it out of its summer sleep. When the streams dry up and are reduced to a succession of stagnant pools, the fishes which breathe only through the gills perish in large numbers by reason of the pollution of the water and consequent corruption of the air it contains; but the *Ceratodus* comes to the surface about once in thirty or forty minutes and fills its lungs with fresh air, and thus remains full of life and vigor in an abode that would be otherwise fatal to it. It is a curious fact that the two largest and fiercest marsupial beasts of prey, the dog-headed and wolfish *Tylacinus cynocephalus* and untamable *Dasyurus* or *Sarcophilus ursinus*, popularly called the Tasmanian devil, are extinct in Australia, and are now found only in Tasmania or Van Diemen's Land. Their disappearance is evidently due to the introduction of the dingo into Australia by the blacks, when they migrated to that country; for neither the so-called aborigines nor the dingo are indigenous in the strictest sense of the term. As the latter multiplied and went wild, it became the most formidable rival and foe of both the above-mentioned rapacious marsupials, and gradually exterminated them, so that they now exist only in Van Diemen's Land, where the dingo is unknown.

Exceedingly interesting and instructive are the sections of Semon's work which embody the results of his anthropological researches. The Negritos or native Australians are still living in a stage of culture corresponding to the palæolithic period or old stone age of primitive European man. Although inhabiting a land rich in ores, and especially in gold and copper, the use of metals is unknown to them except so far as they have obtained steel knives and tomahawks from white colonists with whom they have come in contact. All the weapons and implements manufactured by themselves are made of stone, bones, shells, wood, vegetable fibers, or the sinews of animals. The same is true of the Papuans of New Guinea,

although these are more advanced in civilization and belong to the neolithic period of human development, as well as of the Poly-

GIRLS AND BOYS OF HULA.

nesians inhabiting the more eastern islands of the Pacific Ocean. It must be remembered, however, that this state of things does not

necessarily imply barbarism, for even peoples so highly civilized as the Aztecs and the Peruvians under the Incas, although using ornaments of gold and silver, had not yet learned the art of working in iron, but were still in the bronze period, which in Europe preceded the Glacial epoch. It is remarkable that the Negritos, with rare exceptions, have never attained the slightest degree of artistic excellence in shaping the materials at their command. Their stone hatchets are rudely chipped, instead of being ground and polished like those of the Papuans and Polynesians, and they do not know how to bore a hole through a stone for the insertion of a helve or handle. The same lack of skill is shown in making instruments out of various materials, the ugly wooden clubs, the clumsy and ill-proportioned shields, and the baskets roughly woven out of reeds. There is no evidence of taste in the form or of delicate fancy in the ornamentation of their work, and even when their sole aim is to beautify their persons, as in the painful tattoo, they succeed only in disdisfiguring the back and breast with deep, straight gashes and hideous scars. Their occasional attempts to draw figures of men or animals are worse than the crude and awkward scrawlings of a schoolboy on a slate, and consist merely of straight lines extending in different directions and representing arms and legs. Like the palæolithic man of Europe, they have no knowledge of pottery, and have never made earthenware vessels in which to cook food, but roast their meat on hot stones. Only in one respect are they in advance of the European cave men, namely, in the possession of a domestic animal, the dingo, whereas the dog does not appear as the companion of man in Europe until the new stone age.

The Australians are nomads, living by the chase and wandering from place to place in search of game; they have neither cattle nor horses, nor any kind of draught or riding animals. The care of flocks and herds, and especially the ownership of land and the cultivation of the soil, not only presuppose but also promote intellectual culture. The man who plants trees and sows seed, and waits for the ripening of the fruit and the reaping of the harvest, watches the change of seasons, observes meteorological conditions, acquires habits of reflection and calculation, looks to the future, forms plans which it often takes years to realize, acts with foresight, becomes prudent in preparing for exigencies, and thrifty in the management of his affairs. Husbandry is therefore one of the earliest and most effective agents of civilization. The first agriculturist was a Prometheus, an inspirer of "forethought," as the name implies, who fired the human forms of clay with higher aims and aspirations, lifted the race out of primitive brutism, and opened to it a new and illimitable career of progress. The Australian tribes have never

yet been touched by this Promethean spark and quickened to a nobler life. All the faculties that contribute to their success as hunters have attained a wonderful degree of perfection, such as

PAPUAN DESIGNS BURNED ON GOURDS.

uncommonly keen powers of observation, unerring sense of locality, tenacious memory, and a most marvelous ability of drawing correct conclusions from the faintest signs and vestiges of wild animals as to their present abode and condition. The precision with which they hurl spears, clubs, and other rude weapons is as remarkable as their cunning in circumventing the alertest and wiliest game. Although ignorant of the use of bows and arrows, they have devised an excellent and exceedingly original substitute for them in the boomerang, a missile whose peculiar form and functions would seem to imply considerable knowledge of the science of projectiles

and of the action of the atmosphere on the surface of spiral curves, but which, like most great inventions, was unquestionably discovered by accident. Yet with all their sagacity and shrewdness, they are so low down in the scale of intelligence as not to be able to count more than five: one is "garro," two "boö," three "koromde," four "wogaro," and five "boö koromde," compounded of two and three; higher members are not differentiated, but lumped together as "meian," many. It would seem to us quite natural that they should be able to count at least as high as ten with the aid of the fingers of both hands, but such is not the case. An Australian can keep a record of twenty or thirty objects by making a notch for each one in a stick, but he has no name for this sum total and can not carry it in his head. Even the blacks who have learned a little English are incapable of using the English numerals beyond six with any degree of accuracy. Mackenzie, one of the most intelligent of the natives in Semon's service, could by this means count as far as ten and perform very simple processes of addition; thus, for example, if he caught three ant-eaters yesterday and four to-day, he knew that taken together they made seven. But this was the extreme limit of his arithmetical computations; if he brought in three animals on each of three days, he could tell how many there were in all only by producing his tally; the multiplication of three by three was a mental operation far too complicated for him. As with number concepts, so with all abstract ideas, the Australians are incapable of forming them, and have therefore no words to express them. They have no collective names for animal and plant. They perceive very clearly the difference between the various species of venomous serpents in which their country abounds, but they have no terms by which to distinguish one genus from another, but call the whole family "wonge"; while "bui" is used to designate the harmless and edible serpents, of which the *Python spilotes* is the most conspicuous representative. Still more remarkable, perhaps, is the want of distinct designations for colors; they have separate words for the extremes of white, "bambar," and black, "ngurue," * but not for the primary and composite colors red,

PAPUAN CARVINGS ON COCOANUT VASE. This carving is cut into the surface of the cocoanut, a sort of intaglio, which the Italians call *graffiti*.

* The literal meaning of which is "dirty."

orange, yellow, blue, indigo, and violet, which they call "beiar," and it is doubtful whether they discriminate even with the eye between the more delicate hues.

A race of men devoid of the faculty of abstraction would necessarily be very deficient in religious conceptions. This is the case with the Australians, who do not show the faintest traces of a belief in the existence of supernatural beings, and therefore do not worship idols, perform sacrifices, or offer prayers. The ghosts they fear are the spirits of the dead, who, not having been properly buried, are doomed to walk the night. But, however great may be the terror inspired by these nocturnal spooks, no attempt is made to propitiate them; the easiest way of warding off their attacks is to huddle as closely as possible round the camp fire. Disease and death are not regarded as natural events, but dreaded as the work of the sorcerers of hostile tribes, whose influence can be counteracted only by sorcerers of their own tribe. In parts of southern and western Australia a somewhat higher stage of religious evolution has produced a vague sort of demonism with a crude cosmology, in which the founder of the tribe figures as the creator of the world. Here we have an example of ancestor worship as a primitive cult marking the transition from demonism to deism. The Australians have no myths or sagas in the sense of fictitious narrations or traditions of heroic achievements and historical events, but only the simplest tales of magic and wizardry, such as are common to the childhood of the race, and refer almost exclusively to the metamorphosis of men into animals. Thus a bad man was put to death by having spears hurled into him, and thereby changed into an *Echidna aculeata*, or porcupine ant-eater. To the minds of the natives this origin explains the mysterious character of this nocturnal creature, which wanders noiselessly about, and on the slightest suspicion of

PAPUAN BOW OF PALM WOOD, WITH STRING OF RATTAN FIBER AND BAMBOO ARROW.

danger vanishes into the earth as by enchantment. The koala, or phascolarctus, is also a magically transformed black man, and a charming story is told of the friendship between a child and a "wonge" (poisonous serpent), which the parents killed, whereupon the child pined away and died. This tale is told in a German *Märchen*, and the incident is said to have actually happened not long since in New England.

PAPUAN FISH SPEAR. (Aroma.)

The organization of the Australian horde is essentially communistic. Personal property consists merely of such weapons and tools as each man can carry with him on his wanderings. The hunting grounds of every horde are well defined, and their boundaries respected by their neighbors. As a rule they live in peace, because there are no spoils to be won, and therefore no temptations to plundering expeditions. Most of the tribes choose a chief, usually a skillful hunter or sorcerer, whose counsel carries weight, but whose positive authority is very limited; he has no power to dictate laws to the community, or to impose his will arbitrarily on other members of the tribe. The checks upon individual liberty are very slight, and with the exception of a few general restrictions, prescribed by ancient custom, every man is perfectly free and independent in his actions, and even the children do pretty much as they please, and are in this respect far better off than the women, who are wholly subject to their husbands and made to bear the heat and burden of the day. Old men, owing to their long experience, exercise a general oversight and enjoy a certain authority, especially in the training of youth and in the formation of matrimonial connections; occasionally a man of strong character, superior intelligence, and conspicuous valor acquires great influence, as was the case with the famous chieftain of the Dieri, Jalina Piramurana; but what sovereignty he possesses is strictly personal, and does not affect the position of other members of his family, nor confer distinction upon his descendants. His pre-eminence does not lead to any recognition of hereditary rank, nor entitle his children to any privileges of birthright; they are on perfect equality with those of every other tribesman.

The Australians were practical Malthusians long before Malthus, and take the strictest precautions and the severest measures in order to prevent an increase of population beyond the means of subsistence. The fact that a score of herdsmen and more than twice as many husbandmen can live in comfort on an area of land that would furnish only scanty food for a single hunter renders it an imperative necessity for savages to keep their numbers within certain fixed

limits. This stability of the population is preserved by killing or exposing a certain proportion of infants, or by the castration or hypospadic mutilation of a percentage of the boys before puberty. In some tribes every father of a family voluntarily submits to one of these radical operations after the birth of his second or third child. Personal sacrifice for the public good could surely not go further than this.

A fatal consequence of the smallness and isolation of the horde would be the constantly increasing necessity of marriages between persons closely related by ties of blood, and the effect of such unions would soon be perceptible in the physical and mental degeneracy of the race. The Dieri of southern Australia have a tradition that in the beginning fathers, mothers, brothers, sisters, and other next of kin were wont to intermarry indiscriminately, until the injurious results of these connections became apparent and led to their prohibition. First, marriages between parents and children, uncles and nieces, aunts and nephews, were forbidden, and the interdict was then extended to brothers and sisters, and finally to cousins. The result was that after a time all marriages between members of the same horde were prevented by the ban of consanguinity, so that they were obliged to enter into negotiations with other hordes for an interchange of marriageable maidens. The Kurnai, in Gipsland, forbid a man to take a wife who is more nearly related to him than in the fifth degree; but for a people who can neither read nor write or hardly count, and have therefore no genealogical records, it would be difficult to determine precisely the proximity of blood. A simpler and more effective system is that adopted by the Narinyeri, who inhabit the region of southern Australia at the mouth of Murray River. The tribe consists of eighteen independent hordes, and it is strictly forbidden for any man to marry into the horde of his father or his mother. By this regulation marriages between brothers and sisters and between cousins (unless they happen to be the children of two sisters who have not married into the same horde) are prevented. The children belong to the horde of the father, but the totem as the symbol of the family is inherited from the mother, and descends to the maternal line. Some tribes forbid matrimonial unions between persons having the same totem. This prohibition renders it impossible for a man to marry the descendants of his mother's sister, but permits him to marry the descendants of her brother, inasmuch as the

PAPUAN SPEARS.

latter derive their totem from their mother. Some tribes forbid these marriages by special enactments; others arrange the nearly

WEAPONS AND UTENSILS FROM SOUTHEASTERN NEW GUINEA. Those marked with a * come from the Trobriand Islands. 1–3, wooden clubs; 4, club with stone head; 5, war shield; 6, dance shield; 7, drum; 8–11, tobacco pipes of bamboo; 12, nest of baskets; 13, 14, skirts for women; 15–17, gourd flasks; 18–20, stone axes with handles; 21, bow of canoe.

related totems into larger groups, corresponding to what ethnographers call phratries, which can not intermarry. Without entering

into further details we may state that everything referring to the propagation of the species is carefully regulated, with the object of compelling men to take wives from alien hordes. The most important Australian feast is the celebration of the attainment of puberty by the young men, who on this occasion are subjected to severe ordeals and cruel tortures, such as circumcision, ghastly tattooing, or the extraction of one or two front teeth.

It has been asserted that the Australians represent a degenerate race, and that their remote ancestors had attained a far higher degree of civilization. Some paintings, which adorn the walls of caves on Glenelg River, in northwestern Australia, have been adduced in support of this hypothesis. It is evident, however, from the cast of the features, the cranial formation, the long garments, hats, and shoes of the figures in these sketches that they were made by shipwrecked Europeans, or perhaps Phœnicians. Everything in the life, language, traditions, habits, and general character of the Australians indicates a primitive people who, instead of deteriorating, have made some slight advancement in culture. The fact that they show no marks of near kinship with their neighboring islanders, the Papuans, Malays, or Maoris, tends to complicate the question of their origin. They possess many anthropological characteristics in common with the Dravidian hill tribes of the Deccan and the pre-Dravidian Veddas of Ceylon, such as the shape of the skull, the outlines of the face, and the waviness (in distinction from woolliness) of the hair; and these physical resemblances acquire additional significance through striking similarities in the Dravidian and Australian languages. If it be true as has been maintained, and seems highly probable, that the Caucasian race is of Dravidian origin, the Australians might claim to be very remote kinsmen of the Europeans, and their likeness to degenerate types of the latter is certainly quite strong.

As already indicated, the Papuans of New Guinea belong to the later or neolithic period of the stone age, and their superior culture is especially manifest in their artistic skill and taste. Their implements are made of wood, stone, shells, bones, and similar materials, and they have never learned the use of any metal. The hatchets, of feldspar, hornblende, and other stones, are not rudely chipped, but beautifully polished, and they manufacture vessels of burned clay in which to cook their food. Everything they fabricate is remarkable for elegance of form and delicacy of ornamentation. One can not but wonder at the perfection of workmanship wrought by stone tools—knives and daggers exquisitely carved out of wood or the bones of the cassowary, bracelets, frontlets, and necklaces of

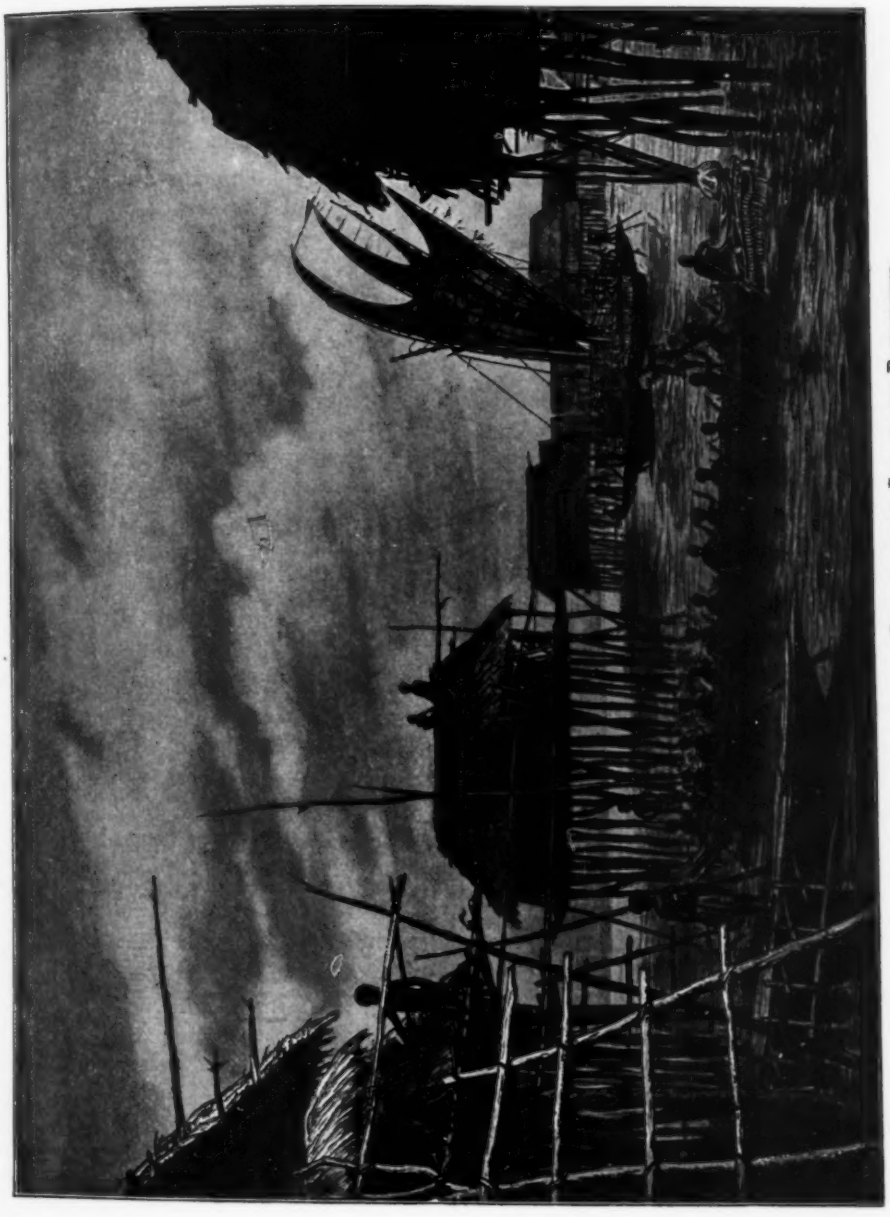
clubs; 4, club with stone head; 5, war shield; 6, dance shield; 7, drum; 8–11, tobacco pipes of bamboo; 12, nest of baskets; 13, 14, skirts for women; 15–17, gourd flasks; 18–20, stone axes with handles; 21, bow of canoe.

shells, mother-of-pearl, dogs' teeth, and straw braids finely woven. A peculiar and apparently much-prized decoration for the wrist is the lower jaw of a foe, slain in battle, with tassels or other pendent ornaments. Mussel and cockle shells serve as currency, an advance from bimetallism to bivalvism that ought to be welcome to every advocate of cheap money. The most graceful and symmetrical designs are scratched on bamboo tobacco pipes, gourds, and cocoanuts, and burned in; and all these forms and figures reveal a refinement and a fertility of imagination and a facility of mechanical execution that excite admiration and astonishment. The most charming variety of arrangement is given to the simplest pattern wrought on curved surfaces in the purest style of arabesque. Like the neolithic men of Europe, they use bows and arrows, as well as clubs and spears, which are exceedingly graceful in shape; and compared with their strong and slender oars, ours are heavy and clumsy. The same is true of their sails of matting. They also bore holes in the heads of their stone hatchets for fastening the handles. Unlike the Australians, they have a fine sense of color, which they gratify by painting their shields white, red, and black, adorning their heads with the brilliant feathers of the bird-of-paradise, the parrot, and the cassowary; by variegated stripes in the women's short skirts, woven out of grasses, reeds, and the fibers of the cocoanut, and the "lines of beauty" with which they tattoo their dark-brown skin.

The constitution of the Papuan tribe, like that of the Australian horde, is radically democratic, but differs from it in being much less communistic. Private property, in distinction from tribal possession, begins with the tillage of the soil, and this general principle applies to the fields, houses, and tools of the Papuans; but the greed of gain has not yet been developed; each family cultivates land enough for its own subsistence, in addition to the products of the chase, and there is no distinction of rich and poor. The position of a chieftain confers upon him little authority, and whatever influence he exerts is due solely to his strong personal qualities, as is the case at present with the famous Koapena, of Aroma, a man equally distinguished for his valor in war and his discernment and impartiality in the administration of justice.

The houses are built on piles, like the lake dwellings of the primitive Swiss, and sometimes stand so far out in the sea that they are surrounded by water even at ebb tide. This construction of the villages is designed to protect the inhabitants less against the attacks of wild beasts than against the assaults of the fierce mountain tribes of the interior. A curious institution is the "Marea," or bachelors' clubhouse, as Semon calls it, in which boys, on attaining the age of puberty, take up their abode, and strangers are entertained. The

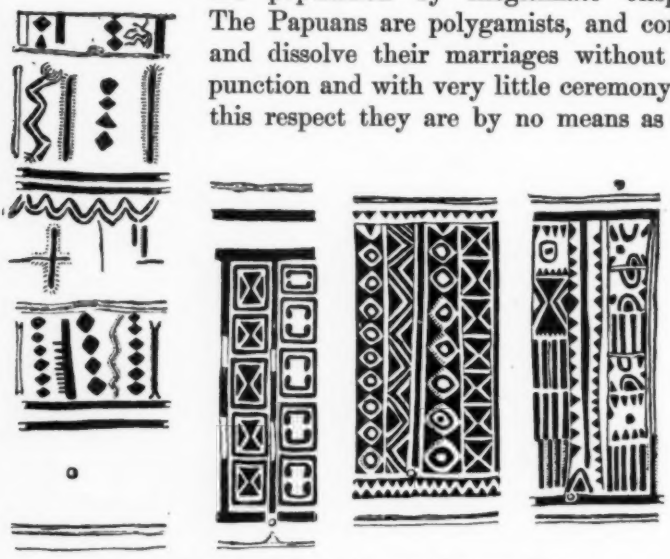
inmates are under the supervision of an elderly man, and their admission to this home of youthful celibates is attended with consider-



PAPUAN LAKE DWELLINGS, WITH A LAKATOI UNDER SAIL IN THE BACKGROUND.

able ceremony, when they are invested with a narrow girdle belt ("ihavuri"), which makes their waists look as slender as that of a

tightly laced girl. The interior of the "Marea" is adorned with weapons and trophies of war and the chase, and the posts are often beautifully carved. No woman is ever permitted to enter it, and its object is to promote chastity and prevent a too rapid increase of the population by illegitimate offspring. The Papuans are polygamists, and contract and dissolve their marriages without compunction and with very little ceremony. In this respect they are by no means as strict



PAPUAN DESIGNS BURNED ON BAMBOO TOBACCO PIPES.

as the Australians, who are monogamists in practice, not because a plurality of wives is prohibited, but because no one is rich enough to maintain a harem.

The religious conceptions of the Papuans are crude, and their sole cult is a sort of worship of ancestors, to whose images, carved in wood, special reverence is paid. The strong attachment to kin, which forms the basis of this worship, finds an extremely unpleasant and unwholesome expression in long periods of mourning, and unwillingness to part with the bodies of the dead. Near relatives sleep for weeks, and even months, by the side of a decaying corpse, and smear themselves with the fetid exudations of putrefaction. The disconsolate widow blackens her body with coal dust, and covers herself from head to foot with a network, which she wears until it rots and falls to pieces, and meanwhile conscientiously abstains from washing. Finally, when the corpse is committed to the earth, it is buried directly under the house, in order to remain as near as possible to the sorrowing survivors, so that each family lives over its own private graveyard. The efforts of the Governor of British New Guinea to abolish these disgusting customs, which cause the spread of infectious diseases and often produce pestilence, have proved for

the most part unavailing, and created intense bitterness wherever they have been made.

The question of the origin and ethnography of the Papuans presents almost insuperable difficulties, and has not yet been satisfactorily solved, although it seems probable that the numerous tribes, notwithstanding their striking physical divergencies, are merely varieties of a general type and offshoots of a common stock. Whether they form an isolated and independent branch of the human family, or are akin to the dolichocephalous, dark-skinned, crisp-haired races of Africa and the islands of the Pacific Ocean, as Huxley suggests, is undetermined and perhaps indeterminable.

THE BRITISH ASSOCIATION AT TORONTO.

By Prof. DANIEL S. MARTIN.

THE meeting of the British Association for the Advancement of Science, held in Toronto in August last, was an occasion of peculiar interest in many ways. The first visit of the association to America, thirteen years ago—the Montreal meeting of 1884—proved so successful and interesting that the invitation from Toronto, urgently pressed upon the body two years since, found a ready response, and has resulted in this important gathering. Our own association, meeting in Detroit during the previous week, had arranged the time and the place with reference to the other; and a large proportion of the American members, including most of those prominent in our association, came to Toronto and took a more or less active part.

The American members, indeed, were no strangers to Toronto, their experience when meeting in that city in 1889 having left a profound impression of the culture and the hospitality of that beautiful university town; so that all who had been there then were glad to revisit the place and renew their pleasing associations. Hence it came to pass that the recent meeting assumed an almost international character. Of the more than thirteen hundred people who attended, it is estimated that in a general way about one third were British members, one third Canadians, and one third from "the States."

Such meetings as this are good in every way. They bring together in bonds of common interest people widely separated by residence, by nationality, and by feeling; and they can not fail to help in the great object which all lovers of science and of humanity are

seeking to promote—the era of universal brotherhood, of "peace on earth and good will toward men."

Some of the impressions of an American member attending this meeting, as to its varied aspects—scientific, political, and social—may be briefly presented in this article, which is intended less as a record of papers and proceedings than as a series of general notes.

Compared with the annual meetings of our own association, one fact attracts notice at once, as it did also at the American meeting in Toronto in 1889, to wit, the official recognition of such a gathering by the city and the provincial authorities, and the granting of liberal appropriations for the entertainment of the scientific visitors. In this case sums estimated at over twenty-five thousand dollars were appropriated, partly by the Dominion Government, partly by the Province of Ontario, and partly by the city, aside from private contributions and entertainments. Our association relies entirely upon the latter source; and its local committees in each place of meeting appeal wholly to wealthy and public-spirited citizens to defray the expenses of the occasion. Here comes to view one point of difference between our methods and those of a country equally free indeed, but in which there abides a slight flavor of that "paternalism" so jealously dreaded among our people.

It goes without saying, however, that in consequence of this liberal provision the meeting was brilliantly successful from a social point of view, the public gatherings and the viceregal reception by the Governor-General and his wife, Lady Aberdeen, being social functions of a very striking character. The scene at the great reception in the Parliament House was one never to be forgotten by those who witnessed it. The long line of invited guests moved slowly through the crowded hall, passing between statuelike guards, in scarlet uniforms or picturesque Highland plaids, to the low dais, where stood Lord and Lady Aberdeen, with Sir John Evans, president of the association, Lord Lister, the ex-president, Lord Kelvin, the greatest of living physicists, and a number of provincial and city officials. The spectacle was both brilliant and impressive, and illustrated a phase of life to which we Americans are strangers—the recognition of intellectual eminence with all the formal honors that official station and social rank can bestow.

At the opening meeting, on the first evening, Wednesday, August 18th, the spacious Massey Hall, in the heart of the city, was thronged. All around its horseshoe-shaped gallery were hung pennants, bearing the coats-of-arms of the past presidents of the association—an array of great names in the history of science. Herschel, Playfair, Tyndall, Huxley, Siemens, Lubbock, Rayleigh, among the great students and discoverers; the Prince Consort, Argyle, Salis-

bury, Vernon-Harcourt, among eminent public men; the Canadian Sir William Dawson, and many others, made indeed a "goodly company." Above the stage hung the arms of Toronto and of Evans. In a few very simple sentences Lord Lister handed over the presidency of the association to Sir John Evans, who then proceeded to deliver his formal address, to which reference will be made further on. At the close short speeches were made by the Governor-General, a man of tall and elegant aspect, of vivacious and rather youthful manner, and of great simplicity and cordiality in personal intercourse; then by Lord Kelvin, gray-haired and gray-bearded, wearing the elaborate insignia of the Grand Cross of the Victorian Order, who seconded the resolution of thanks to President Evans in a speech testifying his appreciation; and finally by Mayor Shaw, of Toronto, who put the resolution to vote. The manner of doing this differed constantly from ours; in no case were *ayes* called for, but the audience was requested to express its assent by applauding; this was done eagerly and warmly; and then, as the assemblage rose, it broke out into singing God Save the Queen as by a spontaneous impulse of loyalty.

President Evans is a bright, active-looking man, grizzled and elderly, but not aged, of medium stature, and with a pleasant though keen expression of countenance. There is nothing remarkable in his appearance, and one might pass him many times without imagining that he occupied so eminent a station in scientific circles. His address was one of much ability and great clearness, and developed some aspects of remarkable interest. His presentation of archæology as a true science, and of its relations to other departments, was admirable, and his concluding suggestions as to the immense break in time that intervenes between the palæolithic and the neolithic vestiges of man were striking and forceful.

The general feeling of cordiality toward the American visitors and members, which appeared in constant allusions, was early voiced in the address of Sir John Evans. After referring to the Montreal meeting of 1884, and now to this second visit of the British Association to Canada, he went on to say: "Our gathering this year presents a feature of entire novelty and extreme interest, inasmuch as the sister association of the United States of America—still mourning the loss of her illustrious president, Professor Cope—and some other learned societies, have made special arrangements to allow of their members coming here to join us. I need hardly say how welcome their presence is, nor how gladly we look forward to their taking part in our discussions and aiding us by interchange of thought. To such a meeting the term 'international' seems almost misapplied. It may rather be described as a family gathering, in which our rela-

tives . . . intimately connected with us by language, literature, and habits of thought, have spontaneously arranged to take part. . . . Here on the frontier between the two great English-speaking nations of the world, who is there that does not inwardly feel that anything which conduces to an intimacy between representatives of two countries, both of them actively engaged in the pursuit of science, may also, through such an intimacy, react on the affairs of daily life, and aid in preserving those cordial relations that have now for so many years existed between the great American Republic and the British Islands, with which her early foundations are indissolubly connected?" President Evans then referred very gracefully to the recent incident of the "log of the Mayflower" as "an interchange of courtesies which has excited the warmest feelings of approbation on both sides of the Atlantic—the return to its proper custodians of one of the most interesting of the relics of the Pilgrim Fathers"; and added the hope that this circumstance might be both an augury and a testimony of mutual regard and esteem between the nations.

This friendly and courteous tone toward Americans was indeed a marked and truly pleasing feature throughout the entire series of meetings; but, at the same time, no one could be misled. It was the tone of well-disposed neighbors, desiring to live in kind relations with us—the two peoples working out their problems and their destiny side by side, but separate. On the other hand, very striking and impressive were the tokens of Canadian national feeling, and Canadian love and loyalty to the empire and to the Queen. Every allusion to the sovereign, to the new ideal of the "Greater Britain," to the closer relationship between the mother land and the world-wide colonies, was received with outbursts of applause that betokened intense patriotic sentiment. The writer was much confirmed in the view, gained in previous visits to that region, that our people generally have no idea of the Canadians—of their resources and their spirit, of their national feeling and national pride, of their attachment to the empire of which they are a part. Joined to these there is more or less indicated a radical distrust of our methods and ideas, as compared with their own. Union or absorption with "the States" is as far as possible from the Canadian heart; and to one who considers impartially, it seems that a very long time must pass, and great changes be wrought in both countries, ere such an event can be other than a dream.

Nor is this a matter for regret; both peoples have their problems to solve and their work to accomplish; both have free institutions; both have energy, courage, and faith in themselves and their mission. As friends and brothers, each for itself, they can best develop this

vast continent on the lines of Anglo-Saxon civilization. An enforced and uncongenial union could have no benefit for either people.

In welcoming the association at the civic reception on Wednesday afternoon, previous to the opening of the meeting, speeches were made by Lord Aberdeen, for the Dominion Government, and Mr. Shaw, the mayor, for the city—the Governor of Ontario, who was to represent the province, being unwell and not present. Mayor Shaw, alluding to the American visitors, expressed the feeling of the Canadians very aptly by saying: "They mingle with our people on the friendliest of terms; we are delighted to have them come, and sorry when they go away. They are our good neighbors—the Americans—but they are only our neighbors. You are more closely related; you are our own kith and kin, . . . though separated by three thousand miles of ocean."

President Evans's address dealt, first, with archæology as a science; he drew a strong distinction between archæology and "antiquarianism," and developed clearly the relations that must exist between archæology, geology, and palæontology, in order to results of any established value. Then, reviewing the history of the science, in which he referred to the fact that the term "prehistoric" was first employed by the late Sir Daniel Wilson, President of the University of Toronto, he passed on to consider its scope. With regard to all questions of human remains or traces prior to the Glacial time, in the Pliocene or earlier, he could see no evidences at all trustworthy, and many elements of serious doubt. But, "when we return to palæolithic man," he said, "it is satisfactory to feel that we are treading on comparatively secure ground, and that the discoveries of the last forty years in Britain alone enable us to a great extent to reconstitute his history." He dwelt at length on the enormous amount of physical change that has taken place in the face of the country since the earlier palæolithic remains were deposited in the gravel beds and caves, and the immense lapse of time thereby indicated. Passing to the question of the origin of palæolithic man, he emphasized the view that he must have reached Britain and northern Europe by migration from a more genial climate, where food was more abundant and clothing less needful, rather than have originated in that inhospitable subarctic region. He then pointed out the wide diffusion of precisely similar implements to those of the Thames and the Somme Valleys, through numerous points of discovery in the Mediterranean region, into northern Africa southward even to Somaliland, and eastward through the valleys of the Nile and of the Euphrates to the Narbuddá Valley in India. Here they are associated with a Pleistocene fauna, closely akin to that of

Europe in palæolithic time, though perhaps a little earlier in type. Along these lines, and from one or other of these tropical sources, he would seek the distribution of palæolithic man. But what of neolithic man? Here President Evans dwelt emphatically on the absolutely unbridged chasm that separates the two types. The closing portion of palæolithic time was marked by the presence of the reindeer in Europe, and by a diminution in the size of the stone hatchets, apparently corresponding with the disappearance of the great mammals of the earlier time. But there is no indication of a ground or polished implement. He inclines to the view strongly that, owing to failure of food or other causes, man died out in northern and central Europe, possibly lingering in the Mediterranean region, as at the cave of Mentone, but that for the most part Europe became uninhabited, and remained so for a long period. When neolithic remains appear, the country has reached the physical conditions of the present time, and there is every indication of a new migration from the east and south. In Egypt and in India finely polished implements are abundant at certain points; and these doubtless indicate the pathway of the second great migration, from which we may more or less dimly trace the beginnings of historic development.

In closing, Sir John Evans urged the importance of establishing a bureau of ethnology for the Greater Britain, as of immense value, not only to the student of anthropology and archæology, but in the practical intercourse of Government officials, travelers, missionaries, and explorers with the native races on the borders of the empire. He paid a handsome tribute to the work of our own Bureau of Ethnology, and also to the researches being carried on in the Dominion, partly by the Government and partly by a committee of the association. The project of such a general bureau had been urged upon the Government by the last meeting, at Liverpool, but so far no action had resulted, the question being one of expense. But if, by a better understanding of native tribes and their modes of life and thought, one "little war" could be avoided, the cost of such an institution would speedily be saved.

The American Association was very much in evidence during the sessions, a number of our leading scientists taking prominent parts. This was most marked in the departments of Geology, Geography, and Anthropology; less so in the other sections, although some able representatives were present in nearly all of them, and most of the sectional committees included one or more names familiar to attendants at the American meetings.

In the section of Anthropology, presided over by Sir William Turner—a portly, florid old gentleman, with white whiskers and

a somewhat impressive manner—the first two papers read were by an American—and a lady—Miss Alice C. Fletcher, whose enthusiastic labors in the field of Indian folklore and traditions are familiar to all American scientists. Her interesting account of the significance of the "scalp-lock" among the Omahas, and of the mystical rites connected with it, giving an insight, as it did, into much that is obscure and unintelligible in the thought and the culture of these peoples, was received with great appreciation. Sir William Turner expressed not only his interest in the paper itself, but his admiration of the manner in which it had been given, and held up Miss Fletcher's delivery as a model to those who should further address the section. Another of the British members, who followed in the discussion, said that one of the objects of interest that had led him to cross the ocean to this meeting was the hope of seeing and hearing Miss Fletcher. Prominent in this section were also Prof. F. W. Putnam, so long the efficient secretary and now chosen as the president of the American Association, and Prof. W J McGee, of the Bureau of Ethnology, Prof. Edward S. Morse, and Lieutenant Cushing, of Zuñi fame. Professor Putnam explained quite fully the great Jesup expedition, now partly in the field, for the ethnological study of the shores of the North Pacific, with the object of obtaining light on the origin of the North American races. This led to an exceedingly animated discussion on the question of Asiatic or other migrations, in which Professor Morse, at the request of the chairman, took a leading part. He presented very forcibly, from his long and familiar acquaintance with Japan and the east coast of Asia, the notable absence among the American coast peoples of many, or nearly all, of the habits and utensils that are most widely and commonly diffused on the Asiatic side. On the other hand, he was inclined to trace some curious art resemblances from the Mediterranean, by the Canary Islands, to South and Central America. Sir William Turner then called on Lieutenant Cushing, who dwelt upon the spontaneous origin of peculiar forms of utensils and decorations, and the need of caution in drawing conclusions from resemblances. Another most active and interesting discussion was that held on the last day, before a joint meeting of the departments of Anthropology and Geology, which was again opened by Professor Putnam, on the subject of the evidence of Glacial or Preglacial man in America. His remarks were principally an account of the argillite implements from the Trenton gravels, first discovered by Dr. C. C. Abbott, and now being systematically worked for by Professor Putnam's assistants. He was followed by Professor Claypole, of Ohio, describing a finely chipped flint implement obtained in a deep well, firmly imbedded in glacial drift. The

discussion was then taken up by Sir John Evans, who at some length expressed his dissent from the views thus far presented, holding that nothing had yet been found in North America that would properly be called *palæolithic* in the Old World—i. e., presenting certain types of shaping, and associated with a properly extinct fauna. If the remains thus found and described are truly associated with glacial deposits, then we can only say that the neolithic period extends much farther back in America than it does in Europe. Professor McGee followed in a somewhat similar strain, questioning the age of the beds. Professors Putnam and Claypole responded; and the whole discussion was a battle of chieftains on both sides, of great interest, but with little definite result. The foreign archæologists are indisposed to admit the remote age of our American specimens; and it is plain that a great deal remains to be done ere archæology in this country can be definitely adjusted to a recognized correspondence with that of the European continent.

In the department of Geography, the opening address of Prof. J. Scott Keltie, on the areas of the globe that are yet unmapped and awaiting the explorer, included an able summing up of geographical progress during the Victorian era, embracing not only the opening of the unknown interior regions of Asia, Africa, and Australia, but the whole science of oceanography, and nearly the entire history of polar and circumpolar exploration. A figure of much interest was the explorer and "mighty hunter," F. C. Selous, of Africa, well known to all the tribes from the Zambesi to the Cape, whose paper, On the Economic Value of Rhodesia, was one that attracted much attention. It is said that Mr. Selous is the original after whom Rider Haggard drew his character of Alan Quatermain. Another leading figure was Sir George Robertson, the defender of the Chitral forts in the contest of 1896, who occupied the first place after the president's address with an illustrated paper on Kafiristan and the Kafirs. It was of interest also to see Prince Krapotkin, who presented papers in both this and the geological section, illustrated with maps, which he remarked had been kindly sent him from Russia after his escape from prison! American geographical work had a prominent place among the papers and proceedings of this section, as may be seen from the following list: Mr. Marcus Baker, Institutions Engaged in Geographical Work in the United States; Prof. W. M. Davis, Geography as a University Subject, and The Coastal Plain of Maine; Prof. R. E. Dodge, Scientific Geography for Schools; Mr. Henry Gannett (communicated by General Greely), The Material Conditions and Growth of the United States; Mr. F. H. Newell, The Hydrography of the United States; Prof. T. C. Mendenhall, The Geographical Work of the United

States Coast and Geodetic Survey; Prof. Charles D. Walcott (read by Prof. G. K. Gilbert), The Geographical Work of the United States Geological Survey.

The section of Geology was opened by the address of its president, Dr. G. M. Dawson, F. R. S., who gave an admirably clear and unbiased outline of the history and progress of Canadian geology, with special reference, of course, to the great labors and discoveries of Logan, Murray, Selwyn, and their co-workers in the Archæan and pre-Cambrian rocks of Canada. Professor Dawson well described and defined the Laurentian and Huronian terranes; but he does not favor the term Algonkian, and does not recognize it as expressing any definite system of rocks between the Huronian and the Cambrian. To go into any discussion of the many interesting papers in this section would be impossible within the limits of this sketch. A large amount of attention was given to glacial geology, both by American and Canadian contributors—Professors Chamberlin, Fairchild, Gilbert, Hitchcock, and Willis among the former, and Professors Coleman, Spencer, Taylor, and Tyrrell among the latter. Mr. Tyrrell's account of the succession of the glaciers over Canada was of great interest, indicating three successive centers of ice-sheet movement over the region between the Rocky Mountains and Hudson Bay—the first western, the second central, and the third eastern. In the discussion that followed, some of the British members expressed great interest in this view, as corresponding with indications of a similar shifting of the glacial center of movement in Europe, but in the opposite direction—from the east westward. Prof. John Milne, who gave the evening lecture on Earthquakes and Volcanoes, laid before the section a report—the second made to the association—on Seismological Investigations, in which he developed some striking views. He regards the ocean floors as the great areas of instability and the seat of by far the chief part of seismic movements, and believes it probable that important faultings and sinkages are constantly occurring, and that such peculiar abyssal areas as the "Tuscarora deep," etc., and the frequent accidents to ocean cables, are evidences of this condition.

Passing over the sections devoted to biological subjects, zoölogy, botany, and physiology, in all of which the presidential addresses and the papers and discussions were of abundant interest, a few words must be given to those that dealt with other classes of facts—physical, chemical, and sociological. The address of Professor Ramsay on The Evidences for the Existence of a yet Undiscovered Gas coming between helium and argon in its density and its properties, and describing his elaborately delicate experiments to separate it, if possible, from helium—though as yet without definite re-

sult—was a striking example of the combination of actual physical experimentation with the most abstruse theories and problems as to the properties of matter. The paper of Professor Meslans, of Nancy, on his own and Moissan's process for the separation and liquefaction of fluorine, was a matter of extraordinary interest, as the experiment was conducted in the presence of the section. The number of physical and electrical papers was very large, and no attempt can here be made to discuss them. Section A, Mathematical and Physical Science, has subdivisions or "departments"—one on electrical science, one on meteorology, one on general physics, etc.—all of which were active during the meeting.

The section on Economics and Statistics had a smaller number of papers, but of a class that has great attraction for many minds, especially at the present time. Our own Labor Commissioner, Mr. Carroll D. Wright, presented a paper on The Relation of the Employment of Women and Children to that of Men; and various other papers, relating largely to American and Canadian problems as to finance, trade, taxation, etc., were read and discussed.

It remains to allude briefly to a few of the more general public occasions. There were two evening lectures delivered in Massey Hall, before referred to: one on Friday, by Professor Roberts-Austen, F. R. S., on Canada's Metals, and the other on Monday, by Sir John Milne, on Earthquakes and Volcanoes. Both of these were interesting and instructive. Professor Roberts-Austen, who now is to succeed the Hon. Mr. Vernon Harcourt, who resigned the office of general secretary after fourteen years of service, presented a very full account of the resources of the great Dominion in metallic wealth; and Sir John Milne gave a large amount of novel and striking matter in regard to earthquakes and seismology, derived from long residence and study in the restless region of Japan. Some of his large projected illustrations of earthquake action, as photographed in that country, were highly impressive.

The two universities, Toronto and Trinity, which have their beautiful buildings and grounds in the city, had both arranged to confer honorary degrees upon the leading officers of the association at a formal "convocation." The one held by the University of Toronto came first, and took place in the large pavilion building of the Horticultural Gardens, on the afternoon of Friday, August 20th. The scene was highly interesting; the president of the university, Dr. Loudon, in his academic gown, with the red-lined hood of a doctor of laws, announced in each case to the audience the action of the institution in conferring the degree; then, turning to the recipient, he addressed him in Latin with the words of formal investiture; and then called him forward to the front of the platform to

sign his name in the volume of the university register, while the building rang with applause. The recipient, who also wore the red-lined hood of his new doctorate, then responded in a short address. In succession this form was gone through for Lord Kelvin, Lord Lister, Sir John Evans, and Mr. Hardy, Attorney General of the Dominion. Prof. Wolcott Gibbs, President of the American Association, was also similarly honored, but he was unable to be at Toronto in consequence of illness.

The addresses made by the recipients were interesting as being characteristic. Lord Kelvin spoke, in his distinctly Scotch accent, as a univarsity man, of his interest in the univarsity, and his pleasure in receiving its honors as a tribute not to himself personally, but to the interests of science, to which he had devoted his life. He rejoiced in the growth and progress of Toronto University, its beautiful site, its noble buildings, and its great influence on education throughout the province; himself the son of a univarsity professor, growing up in the atmosphere of such institutions into his own career, first as a student and then as a professor, all his life had been spent in such relations, and he knew them and loved them best of all. Lord Lister spoke but briefly; he is a man of rather few words, with a sweet and genial benevolence of aspect that is characteristic of the kind, cultured, and aged physician. He could add little, he said, to what Lord Kelvin had already expressed, save to make some particular reference to the work of the university in establishing and advancing the high grade of medical education in the Dominion. Sir John Evans followed, and referred to the contrast between his own history and experience and that of Lord Kelvin, he never having been a university man, and having gained and learned whatever he had achieved without those early advantages and associations that were so rich and attractive. Other addresses were made by Mr. Hardy and the viceroy, Lord Aberdeen.

The convocation at Trinity University was similar in general character and aspect; but the beautiful chapel in which it was held was so crowded that the writer was unable to enter, and can not describe it in detail.

The *conversazione*, held on the last evening before the close of the meeting, in the main building of Toronto University, was a brilliant social reception, less formal than that of the viceroy, and unmarked by the military guards that formed so conspicuous a feature at the Parliament House, but in other respects equally handsome and equally thronged.

After the adjournment, on Wednesday, a banquet was given to the chief officers of the association, which is described by those present as again a very brilliant scene. The speeches that followed

have been more or less reported in our public press, in particular that of Mr. James Bryce, on Jingoism, which has naturally attracted considerable notice. Of this, and the many kind and enthusiastic words that were uttered on this occasion, there is no space here to remark. Suffice it to say that there is a profound belief in the minds of cultivated and thoughtful men of both Britain and America that the real heart of each nation is friendly to the other, and that the harsh and reckless utterances of a sensational or partisan press are no index to the true feelings of the people. Lord Lister expressed this precise idea in a brief conversation with the writer, as Mr. Bryce has also most forcibly done in both public and private relations.

Other aspects of the meeting must perforce be omitted, although there is much temptation to linger upon them. The private hospitality so freely shown, the attractive lawn parties in beautiful grounds and houses of the city, such as "The Grange," where Prof. Goldwin Smith received the visitors, and many like occasions of social converse; the labors of the Local Committee, from the hard-worked and efficient secretary, Professor Macallum, to the many courteous assistants whose names are unrecognized and overlooked; the immense impetus given by such a meeting to many forms of scientific interest in the community and the Dominion, to bear fruit and achieve important results for years to come—all these, and many more, are subjects of delightful remembrance. For us, in "the States," there should be also the influence of a healthful pride and a kindly rivalry to strengthen and build up our own association, and to appreciate more than perhaps we have before its importance to the country and to science. The next meeting will signalize its first half century, and it will be held, very fittingly, in Boston. President Putnam, at the closing banquet, invited the British members to come over and be our guests in 1898. At all events, let us endeavor to make that meeting a memorable success, as was the British meeting at Toronto.

PROJECTS are in agitation in England, France, and Germany for taming African elephants and training them to work. It is proposed to establish stations at suitable points in settlements near regions inhabited by elephants, to which young animals may be brought, suitably cared for, and broken in by skilled trainers imported from Asia.

"SUCH is the innate folly of man," says Sir William Martin Conway, in his First Crossing of Spitzbergen, "that when he sees a beautiful view, he desires to be in the midst of it. . . . But the beauty is not there, but here, whence it is beheld. Not on that golden surface of the rippled sea, not on that rose-tinted peak, but here. Tell a man this a thousand times; repeat it to yourself; it is useless."

THE RACIAL GEOGRAPHY OF EUROPE.

A SOCIOLOGICAL STUDY.

(*Lowell Institute Lectures, 1896.*)

By WILLIAM Z. RIPLEY, Ph. D.,
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X.—GERMANY.

GERMANIA! A word entirely foreign to the Teutonic speech of northern Europe. Deutschland then, the country of the Deutsch—not Dutch, for they are really Netherlanders. What do these words mean? What territories, what peoples do they comprehend? The Austrians speak as pure German as the Prussians; yet the defeat of Königgratz, barely a generation ago, left them outside of Germany. On the other hand, the Polish peasants of eastern Prussia, with their purely Slavic language, are accounted Germans in good standing to-day.*

Ambiguous linguistically, do these words, German or Deutsch, imply any temperamental or religious unity? This can not be, for the main participants in the Thirty Years' War—

> "Fighting for conciliation,
> And hating each other for the love of God"—

were Germans. Historians are accustomed to identify the division line of belief in this conflict with that of racial origin. They are pleased to make the independent, liberty-loving spirit of the Teutonic race responsible for the Protestant Reformation. Let us not be too sure about that. Such bold generalizations are often misleading. Racial boundaries are not so simple in outline. The Prussians and the Prussian Saxons—Martin Luther was one—were anything but pure Teutons racially; this did not prevent them from siding with Prince Christian and Gustavus Adolphus. And then there were the Bohemians who began the revolt, and the Swiss Calvinists, and the rebels of the Peasants' War in Würtemberg! None of these were ethnically Teutons. Let us beware of such ascriptions of a monopoly of virtue or intellect to any given race, however comforting they may be to us who are of Teutonic descent. Modern Germany, to be sure, is half Catholic and half Protestant, but the division was not of ethnic origin in any sense. Thus the word German is even more nondescript religiously than linguistically. In

* Fine map by von Fircks in Zeits. kön. preuss. statistischen Bureaus, Berlin, xxxiii, 1893, pp. 189–296.

short, it applies to-day to an entirely artificial concept—nationality—the product of time and place. Religious, linguistic, and in large measure political differences have merged themselves in a sympathetic unity. Thus has the original meaning of the word Deutsch—a people or nation—come to its truest expression at last.

The fact is that nationality need not of necessity imply any greater uniformity of ethnic origin than of either linguistic or religious affiliations. Such we have seen is the case in France and Italy. Especially clear are the two distinct racial elements in the latter case. Now in Germany, on the northern slopes of the main European watershed, we are confronted with a great nation, whose constituent parts are equally divergent in physical origin. With the shifting of scene, new actors participate, although the plot is ever the same. This time it is not a question of the Alpine and Mediterranean races. The Alpine element remains, but the Teuton replaces the other. Briefly stated, the situation is this: northwestern Germany—Hanover, Schleswig-Holstein, Westphalia—is distinctly allied to the physical type of the Swedes, Norwegians, and Danes. All the remainder of the empire—no, not even excluding Prussia, east of the Elbe—is less Teutonic in type, until finally in the essentially Alpine broad-headed populations of Baden, Würtemberg, and Bavaria in the south the Teutonic race passes from view. The only difference, then, between Germany and France in respect of race is that the northern country has a little more Teutonic blood in it. As for that portion of the empire which was two generations ago politically distinct from Prussia, the South German Confederation, it is in no wise racially distinguishable from central France. Thus has political history perverted ethnology; and, notwithstanding, each nation is probably the better for the blend, however loath it may be to acknowledge it.*

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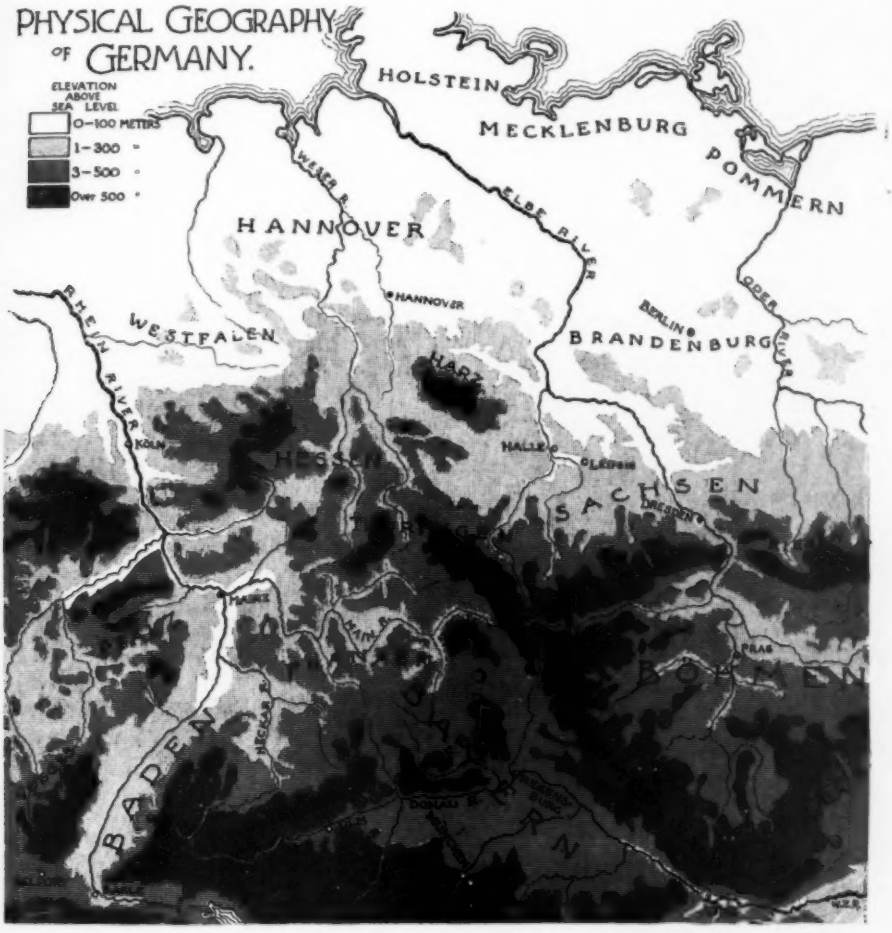
* It is to be regretted that so many of our authorities on Germany have relied upon craniometric investigations rather than study of the living population. Even more grievous is the paucity of evidence regarding the northeastern third of the empire. In our Bibliography of the Anthropology and Ethnology of Europe, to appear shortly in a Bulletin of the Boston Public Library, we have indexed all our authorities, where they may be found *in extenso*. In this place we may merely mention the larger standard works arranged chronologically: H. Welcker, Kraniologische Mittheilungen, Archiv f. Anth., i, pp. 89–160, 1862. A. Ecker, Crania Germaniæ meridionalis occidentalis, Freiburg i. B., 1865. H. von Hölder Zusammenstellung der in Württemberg vorkommenden Schädelformen, Stuttgart, 1876. R. Virchow, Beiträge zur physischen Anthropologie der Deutschen u. s. w., Abh. kön. Akad. Wiss., Berlin, 1876; and also Gesammtbericht über die Erhebungen über die Farbe der Schulkinder in Deutschland, Archiv f. Anth., xvi, pp. 275–477, 1886. J. Ranke, Beiträge zur physischen Anthropologie der Bayern, München, 1883. O. Ammon, Natürliche Auslese beim Menschen, Karlsruhe i. B., 1893, and in other monographs (*vide* bibliography). Equally important, although not restricted to Germany alone, are the papers by Prof. J. Kollmann, especially his Schädel aus alten Grabstätten Bayerns, in Beit. zur Anth. Bayerns,

First, and always, as to the physical geography of the country: everything ethnically depends upon that. It is depicted upon the



It will be observed that in all cases we have preserved the German spelling of geographical names. This is done for special reasons of weight, which can not be explained in this place.

map on this page, which represents elevation above sea level by means of darkening tints, the mountainous regions being generally designated by the broad bands of shading. Draw a line from

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München, i, 1877, pp. 150–226. Certain technical points concerning these writers we have discussed in L'Anthropologie, Paris, vii, 1896, pp. 619 *seq.* For ethnographic details the older work of Zeuss (*vide* bibliography) is now supplanted by that of K. Müllenhof, which may confidently be relied upon. Howorth, in Jour. Anth. Inst., London, vi and vii, is also good. For a convenient *résumé* of our knowledge, both ethnographic and anthropological, consult Hervé, Les Germains, in Revue mensuelle de l'École d'Anthropologie, Paris, vii, 1897, pp. 65–87.

Breslau, or, since that lies just off our map, let us say from Dresden to the city of Hanover, and thence to Cologne. Such a line roughly divides the uplands from the plains. To the north stretches away the open, flat, sandy expanse of Hanover, Oldenburg, Pomerania, Brandenburg, and Prussia. This vast extent of country is mainly below one hundred metres in elevation above the sea. South of our division line the land rises more or less abruptly to a region upward of a thousand feet in altitude. In Bavaria, Würtemberg, and Bohemia lie extensive table lands fully five hundred feet higher even than this, giving place finally to the high Alps. The transition from north to south is particularly emphasized along our artificial division line by the fringe of mountains which lie along it, including the Riesen and Erzgebirge bounding Bohemia, the heavily

TEUTONIC BLOND TYPE. Mainz. Stature, 1·75 metre. Cephalic Index, 75.

wooded mountains of Thüringen, and farther west the Harz, the Waldgebirge, and the Westerwald by Cologne. On this side, the highlands across the narrow gully of the Rhine River have already been described in speaking of the Ardennes uplands in France and Belgium. Their extension in Germany is known as the Rhenish plateau.

For the sake of unity of treatment, preserving the general form of argument already adopted in the cases of France and Italy, let us consider the head form of the people first. At once we perceive a progressive broadening of the heads, that is, an increase of cephalic index, as we travel outward from the northwestern corner of the empire in the vicinity of Denmark. Thus we pass from a head form identical with that of the Scandinavians to one in the south in no wise

distinguishable from the Swiss, the Austrian, and other Alpine types in France and northern Italy. Our three accompanying por-

MIXED TYPE. Achern i. Baden. Stature, 1·62 metre. Cephalic Index, 83·3.

traits will serve to illustrate this gradual change of physical type.* The first is a pure blond Teuton, blue-eyed, fair-haired, with the characteristically long head and narrow, oval face of his race. The features are clear cut, the nose finely molded. Such is the model common in the upper classes all over Germany. Among the peasants it becomes more and more frequent as we approach the Danish peninsula. Here in these northwestern provinces it predominates, but gives place slowly to a mixed and broader-headed type as we pass eastward into Prussia. The intermediate type of head form prevalent in regions of ethnic intermixture is depicted in our second portrait. In this particular case the eyes were blue, but the hair was brown. This variety occurs all along the division line between upland and plain, which we traced a few moments ago. It appears that it is indigenous in Thüringen, the Hesses, and, in fact,

DISHARMONIC MIXED TYPE. Bavarian Tyrol.

* For these photographs I am indebted to my very good friend Dr. Otto Ammon of Karlsruhe i. B, whose work we have noted elsewhere.

all the isolated bits of highland down to the Baltic plain. Oftentimes the result of intermixture is a disharmonism, in which the broad Alpine head is conjoined with the longish face of the Teuton, or the reverse. An example of the first combination is depicted herewith. Types of this kind occurring everywhere in the south prove that the Teutonic invaders were finally outnumbered by the indigenous Alpine inhabitants. The pure, unmixed Alpine race finds its expression in the plateaus of Bavaria and Würtemburg, in the Schwarzwald, the Rauhe Alp, and parts of the Thüringerwald. Such is our third type, with its rounded face and skull foreshortened from front to back. Our representative here photographed was dark brown both in hair and eyes, nose rather irregular, less finely molded perhaps; certainly considerably broader at the nostrils than in the Teutons. At the same time the stature was short, only five feet one and a half

ALPINE TYPE. Oberwolfach i. Baden. Stature, 1·59 metre. Cephalic Index, 86·5.

inches, with a correspondingly stocky figure. Other examples of these several types will be found scattered through the following pages. We need not enter into further details. The facts speak for themselves. There can be no doubt of two distinct races of men.

It is especially important to emphasize the fact that the heads broaden not only from the neighborhood of Denmark southward but toward the east as well. This raises what was once a most delicate question. What is the place of the Prussians among the other peoples of modern Germany? The political supremacy of the house of Hohenzollern in the Diet of the empire and the whilom rivalry and jealousy of the other states made it once a matter of some con-

cern to determine this point. Happily for us, such questions have no terrors to-day. We have already seen how securely nationality may rest upon heterogeneity of physical descent. Be that as it may, it seems to be certain that the peasantry of Prussia is far from being purely Teutonic in physical type. We should expect this to be the case, of course, in those eastern provinces, Posen and Silesia, which still retain their Slavic languages as evidence of former political independence. These ought normally to be allied to Russia and eastern Europe, as we have already observed. But as to Brandenburg—the provinces about Berlin. How about them? Do they also betray signs of an intermixture with the broad-headed Alpine race, of which the Slavs are part? It seems to be so indeed. Germany on the east shades off imperceptibly into Lithuania and the Polish provinces of Russia. Little by little the heads broaden to an index rising eighty-three. Whether this is a product of historic expansion we may discuss later. For the present we may accept it as a fact.*

The race question in Germany came to the front some years ago under rather peculiar circumstances. Shortly after the close of the Franco-Prussian War, while the sting of defeat was still smarting in France, de Quatrefages, an eminent anthropologist at Paris, promulgated the theory, afterward published in a *brochure* entitled The Prussian Race, that the dominant people in Germany were not Teutons at all, but were directly descended from the Finns. Being nothing but Finns, they were to be classed with the Lapps and other peoples of western Russia. As a consequence they were alien to Germany—barbarians, ruling by the sword alone. The political effect of such a theory, emanating from so high an authority, may well be imagined. Coming at a time of profound national humiliation in France, when bitter jealousies were still rife among the Germans, the book created a profound sensation. It must be confessed that the tone of the work was by no means judicial, although it was respectably scientific in its outward form. Thus the chapter in it describing the bombardment of the Musée d'Histoire Naturelle, of which de Quatrefages was the director, intended to prove the anti-civilized proclivities of the hated conquerors, could not in the nature of things be entirely dispassionate. The Parisian press, as may be imagined, was not slow to take advantage of such an opportunity. Articles of de Quatrefages in the Revue de Deux Mondes were everywhere quoted, with such additions as seemed fitting under

* Authorities are cited in our article in L'Anthropologie, Paris, vii, 1896, p. 619 *seq.* Kollmann, in Archiv f. Anth., xiii, 1881, p. 117 *seq.*, gives many references. See also Lithuania, Esthonia, etc., in our bibliography above mentioned. Virchow admits it himself, Alte Berliner Schädel, in Verh. Berl. Ges. f. Anth., 1880, p. 234.

the circumstances. The affair promised to become an international incident.

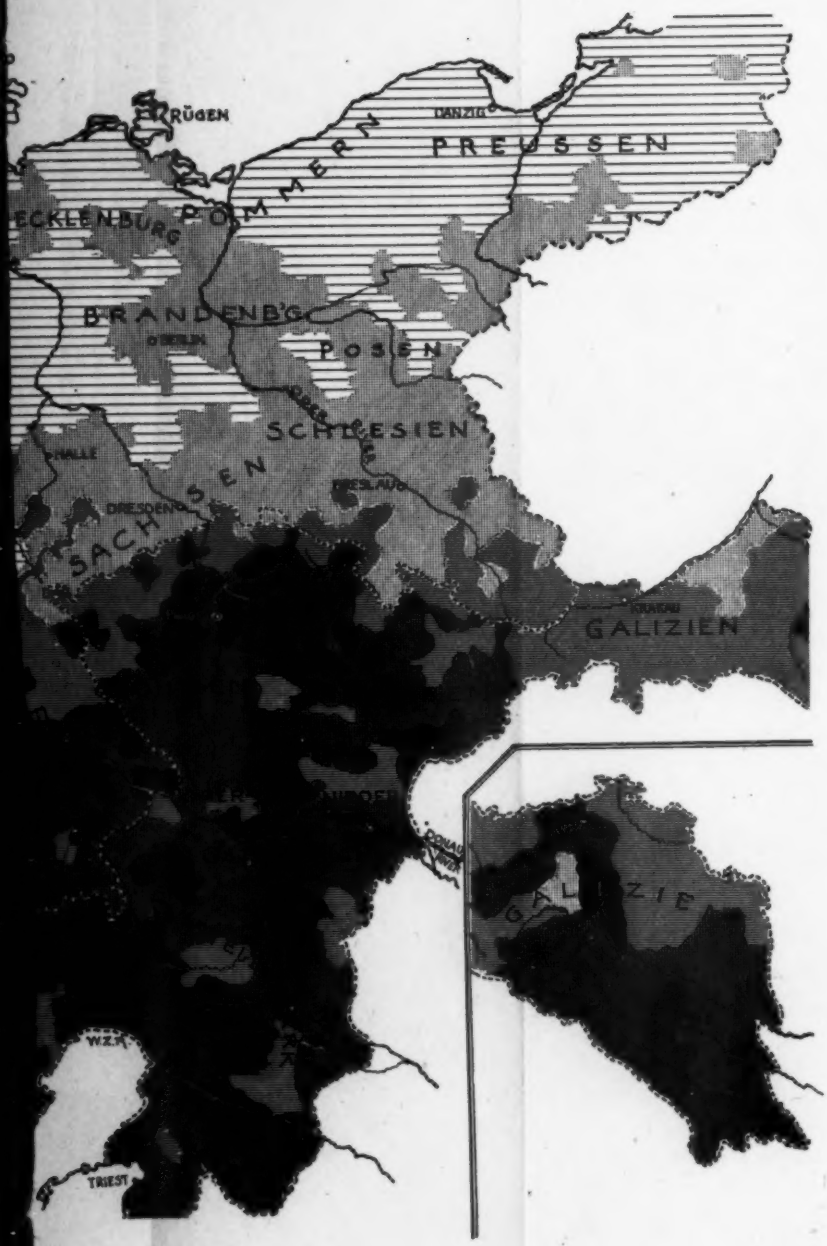
A champion of the Prussians was not hard to find. Professor Virchow of Berlin, set himself at work to disprove the theory which thus damned the dominant people of the empire. The controversy, half political and half scientific, waxed hot at times, both disputants being held victorious by their own people.* One great benefit flowed indirectly from it all, however. The German government was induced to authorize the official census of the color of hair and eyes of the six million school children of the empire which we have so often mentioned in these pages. One of the resultant maps we have reproduced in this article. It established beyond question the differences in pigmentation between the north and south of Germany. At the same time it showed the similarity in blondness between all the peoples along the Baltic. The Hohenzollern territory was as Teutonic in this respect as the Hanoverian. Thus far had the Prussians vindicated their ethnic reputation. It is profoundly to be regretted that the investigation was not extended by a comprehensive census either of stature or of the head form of adults, similar to those conducted in other countries. Such a project was, in fact, sidetracked in favor of the census of school children. Whether politically inspired, or whether considered derogatory to the noble profession of arms, the Prussian army is forbidden for all scientific investigations of this kind, despite the efforts of Virchow and other eminent authorities in that direction; so that data are still scrappy, as we have seen.

To an American the apparent unwillingness on the part of the Germans boldly to own up to the radical ethnic differences which exist between north and south is incomprehensible. It seems to be not improbable that the Teutonic blond race has so persistently been apotheosized by the Germans themselves as the original Aryan civilizer of Europe, that to acknowledge any other racial descent has come to be considered as a confession of humble origin. Or, more likely still, this prejudice in favor of Teutonism is an unconscious reflection from the shining fact that this type is widely prevalent among the aristocracy all over Europe. Whether Aryan or not, it certainly predominates in the ruling classes to-day. At all events, the attempt is constantly being made to prove that the ethnic contrasts between north and south are the product of environmental influences, and not a heritage from widely different ancestry. This is not an impossibility in respect of pigmentation; but it can

* Under the dates of 1871–'72, the articles by the two principal disputants will be found in our Bibliography of the Anthropology of Europe, above mentioned.

RELATIVE FREQUENCY
of
BRUNETTE TYPES.
FROM RANKE '87
10,077,635 CHILDREN.
NEDERLAND
BREMEN
HANNOV
RHEIN
WESTFALEN
BELGIEN
KHEIN-
PROVINZ
PER CENT.
5-10
11-15
16-20
21-25
26-29
GENT

RÜGEN
DANZIG
PRE
POMMERN
MECKLENBURG
SCHLESWIG HOLSTEIN
BREMEN
OVER
BRANDENB'G
BERLIN
POSEN
SCHLESIEN
HALLE
DRESDEN
BRESLAU
SACHSEN
WIEN
TRIEST


RÜGEN
DANZIG
PREUSSEN
POMMERN
ECKLENBURG
BRANDENBG
POSEN
SCHLESIEN
SACHSEN
GALIZIEN
GALIZIE
TRIEST

not be pushed too far. Thus Ranke of Munich, most eminent authority, has striven for years to account for the broad-headedness of the Bavarian population by making it a product of the elevated and often mountainous character of the country. This being proved, it would follow that the Bavarians still were ethnically Teutonic, merely fallen from dolichocephalic grace by reason of change of outward circumstances. This theory seems to be completely incapable of proof; for, as Ranke himself has shown,* the effect of the malnutrition generally incident to an abode at considerable altitudes is entirely in the opposite direction. Among poorly nourished children in factory towns, for example, the immediate effect is to cause an arrest of development about the temples, exactly where the broad-headed Alpine race is so well formed. It is strange to us in America to find how important such matters may become by reason of a social differentiation between races. Another potent example is offered in Russia. The late Professor Zograf, of Moscow, than whom none stood higher as an anthropologist in Russia, confronted by the same division of ethnic types as Germany contains, has positively identified the blond long-headed one as the original Slav.† This may or may not be true; it may be gratifying to have it so. To us the evidence apparently points the other way. In Russia, however, no other conclusion than this would be tolerated for an instant. Pan-Slavism prevails even in science.

After this *excursus*, let us come back to statistics and examine the evidence from the study of blondes and brunettes among the school children. Our double-page map, as will be observed, includes not only the German Empire but Switzerland, Belgium, and Austria, down to the Adriatic as well—exclusive, however, of Hungary. Virchow's great census in Germany was extended over the other countries in quick succession. ‡ The system employed was identical in all, save in Belgium; and even here the definition of brunettes was the same, although the term blond was made more comprehensive. For this reason the results are strictly comparable so far as our map is concerned. A great defect in all such investigations on children, as we have already stated, lies in the tendency to a darkening of hair and eyes with growth. This is probably intensified in the more southern countries, so that our shading probably fails to indicate the full extent of the progressive brunetteness in this direction. North of the Alps, however, we may accept its evidence provisionally, at all events.

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* Beiträge zur Anth. der Bayern, i, 1877, pp. 232 *seq.*, and 285; also ibid., ii, 1879, pp. 75 *seq.*

† *Vide* our Bibliography of Europe.

‡ For Austria, see Schimmer, 1884; for Switzerland, Kollmann, 1883; and for Belgium, Vanderkindere, 1879, in our Bibliography. Full titles are there given.

One or two points on this map deserve mention, after noting the general contrast between northern and southern Germany. Observe how sharp the transition from light to dark becomes all around the mountainous boundaries of Bohemia. Here we pass suddenly from Germanic into foreign territory; for the Bohemian Czechs are truly Slavic in origin as in speech. One wonders if it is purely chance that so accentuated a brunette spot occurs about Prague. That is the capital city, the nucleus of the nation. As for the German-speaking Austrians, they are in no wise distinguishable in pigmentation from the Slovaks, Slovenes, Czechs, or other Slavic neighbors all about them. The second point which we would emphasize is the striking way in which blondness seems to have trickled down, so to speak, through Würtemberg, and even as far as the Swiss frontier. We have already called attention to this in a preceding article. It will bear repetition here. The Rhine Valley bears no relation to it. At first sight, the infiltration seems to have taken place directly across country. Closer inspection shows that it coincides with other evidence derived from the study of the head form in the same district. Especially noteworthy are the peculiarities of Franconia (Franken), the southern edge of which appears as the light-dotted area on our map on page 61. This Franconian long-headed district extends over nearly the whole basin of the Main River well into Bavaria, and, as our map shows, up along the Neckar. It constitutes by far the clearest case of wholesale Teutonic colonization south of the Baltic plain. This is probably the cause of the wedge of blondness upon our large map. Historians tell us the Franks were Teutons, and here is where they first settled.

It is interesting to observe how this Teutonization of Franconia, manifested in our map of brunette traits, tallies with geographical probability. Here is just where we should be led to expect a settlement in any case. Turn back for a moment to our map of physical geography. As the invaders pushed southward, they would naturally avoid the infertile uplands bordering Bohemia, and on the west the difficult, heavily forested Rhenish plateau. Each of these wings of the German upland are of a primitive geological formation, agriculturally unpropitious, especially as compared with Thüringen—rugged, but well watered and kindly, as it is. Suppose our Teutonic tribes to ascend the Weser and its affluents, the Fulda and Werra, or perhaps the narrow gully of the Rhine to Mainz. There would be little to tempt them to turn back to the wooded country, either of Hesse or Thüringen. What was more natural, however, than that sedimentation should take place on reaching the fertile valley of the Main? Its basin, light dotted on our map, with that of the

Neckar just south of it, forms as a consequence the great Teutonic colony in the Alpine highlands. Corroborative testimony of place names also exists. Canon Taylor, for example, states that this district is a hotbed of Teutonic, mainly Saxon, village and local names. It closely resembles parts of England in this respect. Further wholesale colonization to the south seems to have been discouraged by the forbidding Rauhe Alp or Swabian Jura. The Teutonic characteristics have heaped up all along its northern edge, as our map on page 61 shows; but the mountains themselves remain strongholds of the broad-headed type. A considerable colony of dolichocephaly lies on the other side of them, seemingly bearing some relation to the Allgäuer dialect. Beyond this all is Alpine in type. Allemanni and Helvetii have left no trace of their Teutonism in the living population.

Viewed in the light of these geographical facts, the contrast in brunetteness between Würtemberg and Bavaria is readily explained. The fluvial portals of the Bavarian plateau open to the east, not the north. We know that the Boii (Bohemians) and the Bajovars or ancient Bavarians came from this side, following up the course of the Danube. Their names are Keltic, their physical characteristics seem to have been so as well.*

One more physical trait remains for consideration before we pass from the present living population to discuss certain great historic events in Germany which have left their imprint upon the people. We refer to stature.† The patent fact is, of course, that the areas of blondness and of dolichocephaly are also centers of remarkably tall stature. Our three portrait types illustrated this clearly. The first grenadier was five feet nine inches in height (1.75 metre); the mixed type was shorter by about five inches (1.62 metre), while the conscript from the recesses of the Black Forest in Baden stood but five feet two inches in his stockings (1.59 metre). This last case is a bit extreme; averages seldom fall in Germany below five feet five inches. Local variations are common, as elsewhere; crowded city life depresses the average, prosperity raises it; but underneath it all the racial characteristic, so inherent in the Teutons, makes itself felt wherever they have penetrated the territory of the short and sturdy Alpine race. A few anomalies in the distribution of this trait should be noted in passing. In contravention of the gen-

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* *Vide* H. Ranke, Zur Craniologie der Kelten, Beiträge zur Anth. Bayern, vi, 1885, pp. 109–121; and J. Ranke, in ibid., iii, 1880, pp. 149 *seq.*

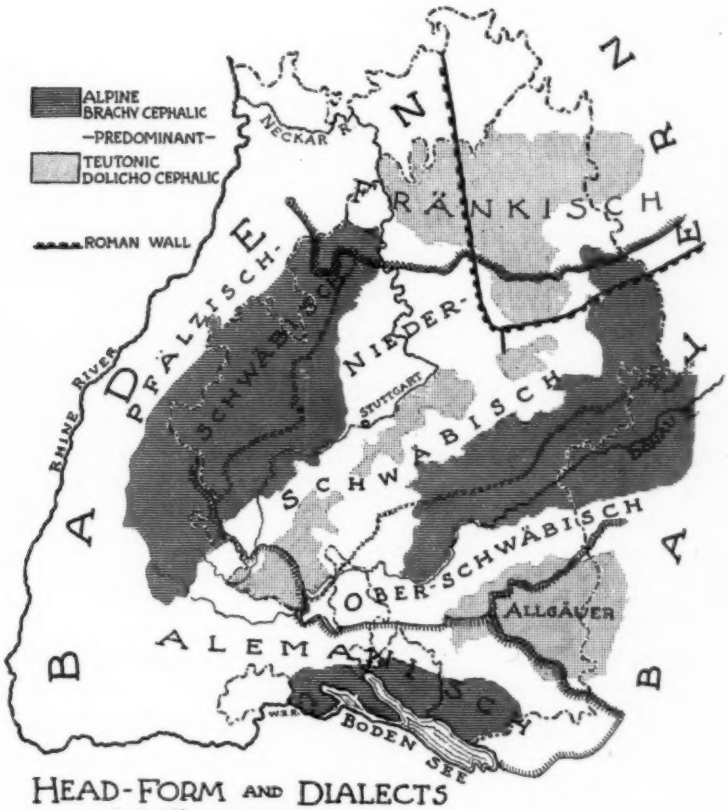
† Ranke, 1881, has mapped it for Bavaria; Ecker, 1876, and Ammon, 1894, for Baden; Meisner, 1889, for Schleswig-Holstein; Reischen, 1889, for part of Prussia, etc. Titles are given in our Bibliography above mentioned; for additional ones see index for "Germany, stature."

eral law, that the severity of climate and poverty of environment in mountainous districts exert a depressing influence upon stature, the Bavarian Alps and the Böhmerwald contain a population distinctly above the general average in the great plateau south of Regensburg. (See map of physical geography.) This is all the more extraordinary, since these mountaineers are Alpinely broad-headed and relatively brunette to an extreme. It would be a highly discouraging combination did we not remember that the great Bavarian plateau is itself of considerable altitude; even then one is led to suspect that some process of selection has been at work to compass such a result. For if we turn to the Black Forest, we there find our racial law holds good. Wolfach, from which our portrait type was taken, exemplifies it completely. Here, on the high plateau known as Die Baar, the average stature falls below five feet four inches, the lowest recorded, I believe, in the empire.

Two great events in the history of northern Europe have profound significance for the anthropologist. The first is the marvelous expansion of the Germans, about the time of the fall of Rome; the second is the corresponding immigration of Slavic hordes from the east. Both of these were potent enough to leave results persistent to this day.

We know nothing of the German tribes until about 100 B. C. Suddenly they loom up in the north, aggressive foes of the Romans. For some time they were held in check by the stubborn resistance of the legions, until finally, when the restraining hand of Rome was withdrawn, they spread all over western Europe in the fourth and fifth centuries of our era. Such are the well-known historic facts. Let us see what archæology may add to them. The first investigators of ancient burial grounds in southern Germany unearthed two distinct types of skulls. The round-headed variety was quite like that of the modern peasantry roundabout. The other dolichocephalic type was less frequent, but strongly marked in places. An additional feature of these latter was noted at once. They were generally found in burial places of a peculiar kind. An easterly sloping hill was especially preferred, on which the skeletons lay feet toward the rising sun—probably a matter of religious importance. The bodies were also regularly disposed in long rows, side by side, a circumstance which led Ecker to term them Reihengräber, or row-graves. Other archæologists, by a study of the personal effects in the graves, succeeded in identifying these people with the tall, blond Teutonic invaders from the north. Such graves are found all through Germany as far north as Thüringia. They bear wit-

ness that Teutonic blood infiltrated through the whole population. The relative intensity of intermixture varied greatly, however, from place to place. Our map on this page shows in a broad way its geographical distribution in Würtemburg and Baden, so far as it can be measured by the head form. Reihengräber and cephalic



HEAD-FORM AND DIALECTS IN WÜRTEMBURG.

AFTER VON HÖLDER '76.

Plain white, the absence of shading on this map denotes an intermediate type of head form incident upon intermixture.

index corroborate one another. The most considerable occupation seems to have been, as we have said, in Franconia. We have already adduced some geographical reasons for the settlement in this place. Still another one remains to be noted. The Frankish race spot seems to lie just outside the great wall, the *Limes Romanus*, which the Emperor Tiberius and his successors built to hold the barbarians in check. Von Hölder has indicated the relation between the long-headed Teutonic areas and this ancient political boundary. Our

map is adapted from his.* The modern limits of the Frankish dialect also coincide with it in great part. Here, just outside the Roman walls, the Burgundians, Helvetians, and Franks undoubtedly were massed for a long time.

The Teutons, in invading the territory of the indigenous Alpine population, only succeeded in displacing the aborigines in part. They followed up the rivers, took possession of the open plains; but everywhere else left the natives in relative purity. This accounts in some measure for the great differentiation between people of mountain and plain all over this part of Europe, to which we have constantly adverted. It endows the whole event with the character of a great social movement, rather than of a sudden military occupation. We can not too fully guard against the hasty assumption that this Teutonic expansion was entirely a forcible dispossession of one people by another. It may have been so on the surface; but its results are too universal to be ascribed to that alone. A revolution of opinion is taking place among anthropologists and historians as well to-day, similar to that which was stimulated in geology many years ago by Sir Charles Lyell. That is to say, conceptions of terrific cataclysms, human or geological, producing great results suddenly, are being supplanted by theories of slow-moving causes, working about us to-day, which, acting constantly, almost imperceptibly, in the aggregate are no less mighty in their results. In pursuance of this change of view, students look to-day to present social slow-working movements for the main explanation of the great racial migrations in the past.

We can not resist the conclusion that the Teutonic expansion must be ascribed in part to the relative infertility of the north of Europe; possibly to differences in birth rates, and the like. Population outran the means of support. For a long while its overflow was dammed back by the Roman Empire, until it finally broke over all barriers. It is conceivable that some such contrast as is now apparent between the French and Germans may have been operative then. The Germans are to-day constantly immigrating into northern France—all over the world, in fact—and why? Simply because population is increasing very rapidly; while in France it is practically at a standstill. Another effective force in inducing emigration from the north may have been differences in social customs indirectly due to environmental influences. Thus Baring-Gould has called attention to the contrasts in customs of inheritance which once obtained between the peasants of northern and southern

* The whole extent of the Roman wall in Germany is shown upon our subsequent map of village types, by means of a similar heavy black line. Its relation there to the Germanic village type can not fail to be observed.

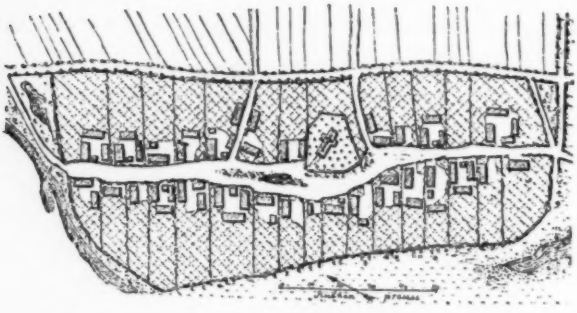
Germany. In the sandy, infertile Baltic plain the land is held in severalty, inheritance taking place in the direct line. The oldest son, sometimes the youngest, remains on the patrimony, while all the other children go forth into the world to make their way alone. Primogeniture prevails, in short. In the fertile parts of Würtemberg, on the other hand, where the village community long persisted, all the children share alike on the death of the father. Each one is a constituent element in the agrarian social body, for which reason no emigration of the younger generation takes place. The underlying reason for this difference may have been that in the north the soil was already saturated with population, so to speak. The farms were too poor to support more than a single family, a condition absent in the south. The net result of such varying customs after a few generations would be to induce a constant Teutonic emigration. Military expeditions may have been merely its superficial manifestation. It would, of course, be unwarranted to suggest that any one of these factors alone could cause the great historic expansion. Nevertheless, it is far from improbable that they were contributory in some degree.

When all the Teutonic tribes broke over bounds and went campaigning and colonizing in Gaul and the Roman Empire, a second great racial wave swept over Germany from the east. Perhaps the Huns and other Asiatic savages may have started it; at all events, the Slavic hordes all over the northeast began to move. Here we have another case of a widespread social phenomenon, military on the surface, but involving too many people to be limited to such forcible occupation. There is abundant evidence that these Slavs did not always drive out the earlier population. They often merely filled up the waste lands, more or less peaceably, thus infiltrating through the whole country without necessarily involving bloodshed.

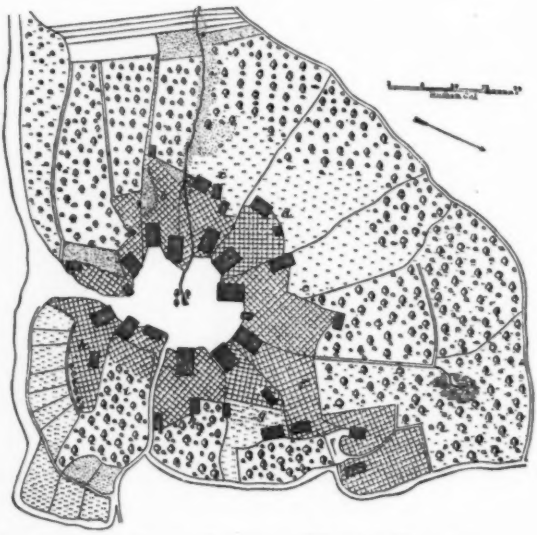
There are several ways in which we may trace the extent of this Slavic invasion before we seek to apply our criteria of physical characteristics. Historically, we know that the Slavs were finally checked by Karl the Great, in the ninth century, at the so-called *Limes Sorabicus*. This fortified frontier is shown on our map on page 66, bounding the area ruled in large squares diagonally. The Slavic settlements may also be traced by means of place names. Those ending in *itz* are very common in Saxony; *zig* also, as in Leipzig; *a* in Jena; *dam* in Potsdam—all these cities were named by Slavs. Indications of this kind abound, showing that the immigrant hordes penetrated almost to the Rhine.

It seems impossible that the movements of a people should be traced merely by the study of the way in which they laid out their vil-

lages; yet August Meitzen, the eminent statistician, has just issued a great four-volume work, in which this has been done with conspicuous success.* It appears that the Slavic peoples in allotting land almost always followed either one of two plans. Sometimes they disposed the houses regularly along a single straight street, the church near the center, with small rectangular plots of garden behind each dwelling. Outside this all land was held in common. Such a village was that of Trebnitz, whose ground plan is shown in our first cut on this page. In other cases it was customary to lay out the settlement in a circular form, constituting what is known as the Slavic round village. In such case there is but one opening to the common in the center, and the holdings in severalty extend outward in triangular sectors. Beyond these, in turn, lie the common pasture and woodlands. Our second diagram represents one of these village types. Contrast either of these simple and systematic settlements with the one plotted in our third map. This Germanic village is utterly irregular. The houses face in every direction, and streets and lanes cross and recross in delightfully hop-skotch fashion. Nor is the agrarian organization of this Germanic



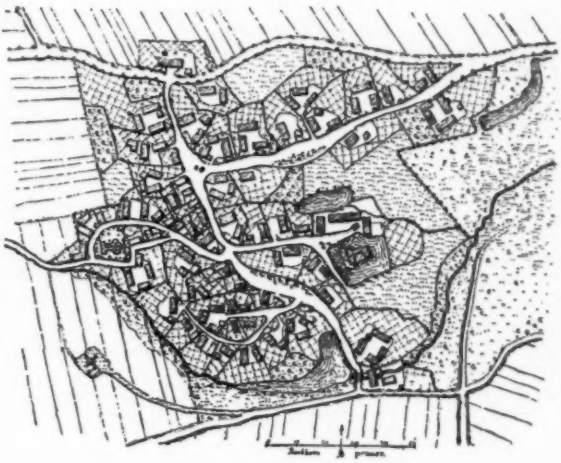
SLAVIC LONG VILLAGE. Trebnitz, Prussian Saxony.



SLAVIC ROUND VILLAGE. Witzeetze, Hanover.

* Siedelung und Agrarwesen der Westgermanen und Ostgermanen, der Kelten, Römer, Finnen und Slawen, Berlin, 1895. Other papers on the same subject are given in our Bibliography.

village by any means simple. Divided into small plots or "hides," so called, a certain number of each kind are, or were once, assigned by lot in rotation to the heads of households. These "hides" were scattered all about the village, so that a peasant might be cultivating twenty or more parcels of land at one time. The organization was highly complex, including ordinances as to the kind of crops to be raised, and other similar matters of detail. We shall not attempt even to outline such a "Hufenverfassung"; for us it must suffice to note the complexity of the type, as opposed to the Slavic form.

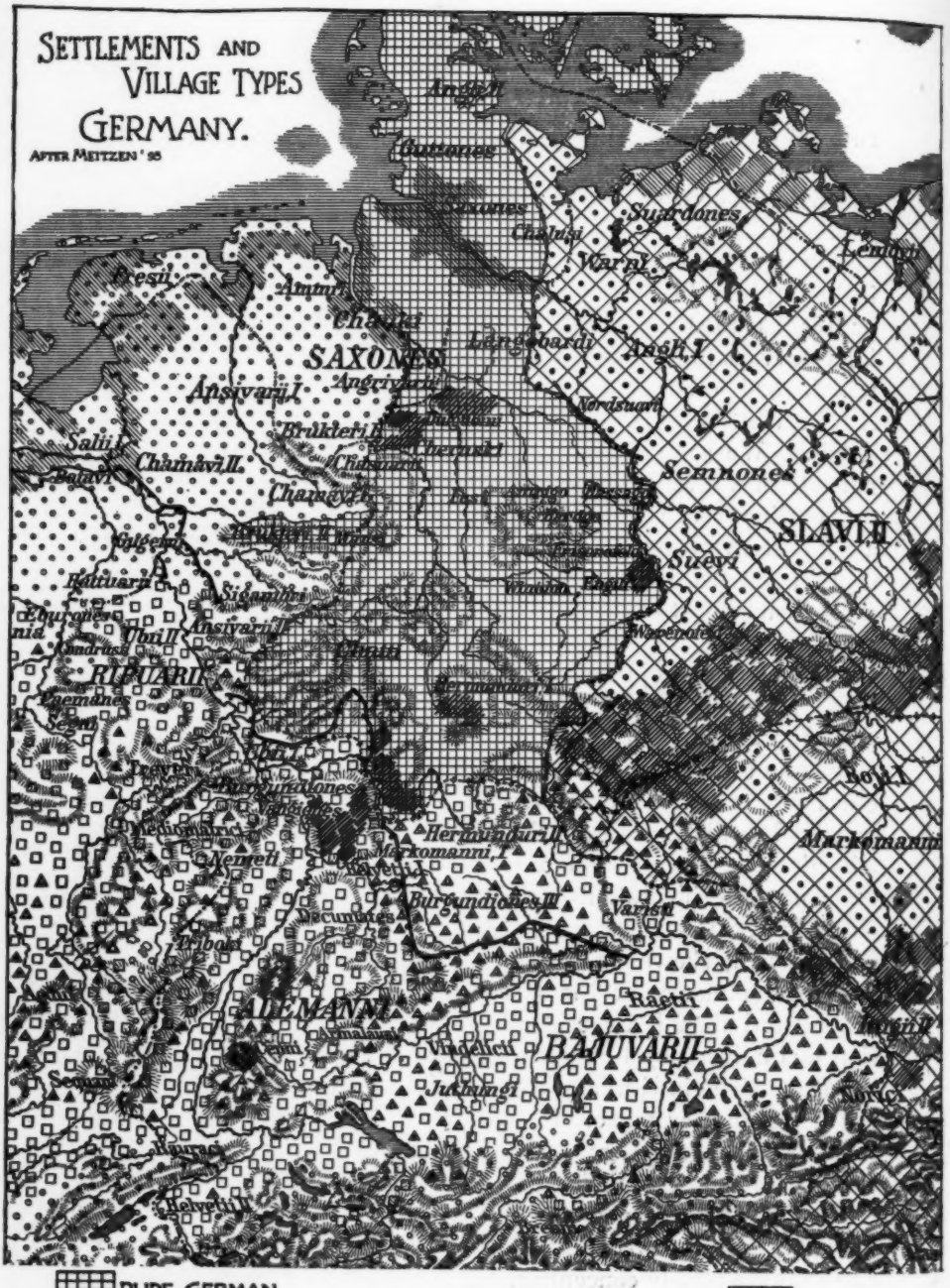


GERMANIC VILLAGE. Geusa, Prussian Saxony.

Our map, close at hand, shows the geographical distribution of these several village types. The circumscribed area of the original Germanic settlements is rather remarkable. It shows how far the Slavs penetrated in number sufficient thus to transform the landscape. It will be observed that on this map the small squares and triangles denote the areas into which the German tribes transplanted their peculiar institutions. That they were temporarily held in check by the Romans appears from the correspondence between the Roman wall, shown by a heavy black line on the map, and the southern boundary of the Germanic villages. Of course, when they spread abroad, a considerable change in the agrarian organization was induced by the fact that the emigrants went as a conquering class. The institutions became less democratic, rather approaching the feudal or manorial type; but they all preserved sufficient peculiarities to manifest their origin. Such hybrid village types, covering all northern France and eastern England, are as good proof of Teutonization as we could ask.*

It will be observed that all the village types we have so far illustrated are closely concentrated and compact. A remarkably sudden change in this respect takes place west of the original Germanic

* *Vide* map in Meitzen's Atlas to volume iii of his great work, Anlage 66a.


SETTLEMENTS AND VILLAGE TYPES
GERMANY.
AFTER MEITZEN '95
SAXONES
SLAVI II
RIPUARII
ALEMANNI
BAIUVARII
Suardones
Semnones
Suevi
Varni
Angli
Warni
Lentiensi
Nordsuavi
Hermunduri II
Markomanni
Varisti
Rugii
Boii
Pribali
Helvetii
PURE GERMAN
GERMAN VILLAGE
MANOR TYPE
CONQUESTS AFTER CAESAR'S TIME
CELTIC HOUSE
SLAVIC
ROUND VILLAGES

village area. The whole economic character of the country changes within a few miles. It is of great historic importance. Our map shows the transition to occur strictly along the course of the Weser River. A large district is here occupied by the Celtic house, so called. The small circles denote that there are no closely built villages at all in the region so marked. Each house stands entirely by itself, in the middle of its farm, generally in no definite relation to the highroads. These latter connect market places and churches perhaps, about which are sometimes dwellings for the schoolmaster, the minister, or storekeeper; but the peasantry, the agricultural population, is scattered entirely broadcast. This resembles the distribution of our American farmers' dwellings in the Western States. We have no time to discuss the origin of these peculiarities. The opinion prevails that they stand in some relation to the clan organization of the Kelts, who are said to have once occupied this territory. The nearest prototype is, as our map shows, in the high Alps.

It is high time to take up once more the main thread of our argument—how far did the Slavic invasion, which so profoundly influenced the agrarian institutions, affect the physical type of the people of Germany? We may subdivide the Slavic-speaking nations of eastern Europe into two groups, which, however, differ from one another and from the pure Alpine race only in degree.* The northern Slavs include the Russians, Poles, Slovaks, Czechs, and Wends; the southern is composed of the Serbs, Croatians, Slovenes, and Albanians. Both of these are broad-headed, the southern group being rather taller and considerably darker than the one which surrounds Germany. All the modern Slavic peoples of northern Europe approximate to the Alpine type; from which it follows that intermixture of them with the Teutons ought normally to produce shorter stature, darker hair and eyes, and, most persistently of all, an increased breadth of head. The district where these changes have been most clearly induced is in the region of Saxony, especially about Halle. A noticeable contrast is apparent between this district and the protected hills of Thuringia. The peasants in the plain of the Saale are appreciably shorter in stature and broader-headed than their neighbors. This Slavic invasion penetrated Bavaria from the northeast, the intruders apparently taking possession of the upland districts, which had been thinly peopled before. So well marked was this that the region south of Baireuth was long known as Slavonia. In places, as at Regensburg and Berlin, we may trace the Slavic intrusion

* The great authority upon this part of Europe is Dr. A. Weisbach, a full list of whose papers is given in our Bibliography of the Ethnology of Europe.

in the different strata of crania in the burial places. The general extent of this Slavonization of Germany is indicated upon our large double-page map of brunette types. The wedge of color which seems to follow down the Oder and over nearly to Holstein is undoubtedly of such origin. Because of this historic movement Saxony, Brandenburg, and Mecklenburg are less purely Teutonic than they once were in respect of pigmentation. The whole east is, as we have already seen, broader-headed, shading off imperceptibly into the countries where pure Slavic languages are in daily use. Thus the contrast in customs and traditions between the eastern and western Germans, which historians since Cæsar have commented upon, seems to have an ethnic basis of fact upon which to rest.

We have now studied the Teutons at home and in their wanderings on the mainland. In our next article we shall see how profoundly they have modified the ethnic complexion of the British Isles. Then we shall be prepared to see how much truth there is in the theory, boldly proclaimed as a proved fact, that they were the original Aryan inventors of European civilization, as well as the chosen agents for its dissemination.

BURS AND BEGGAR'S-TICKS.

By SPENCER TROTTER,
PROFESSOR OF BIOLOGY IN SWARTHMORE COLLEGE, PENNSYLVANIA.

MY setter comes out of the underwoods, after one of his incursive rambles, garnished with strings of green "stickers" and with harsh, brown burs clinging tenaciously to the long, feathery hairs of his tail and about his legs and ears. I have kept in the narrow path to avoid these pests of the autumn woods only to find that they have laid fast hold upon my clothes when by some unwitting step I brushed against the border tangle. In picking them off I notice their curious forms and the fact that they are not all alike. Here are some slender darts that seem to hold by barbed heads; there a row of flattened pods clinging by their whole surface; while numberless tiny brown burs are gathered in groups or scattered promiscuously about trouser legs and coat skirt.

It is strange how an interest is suddenly awakened about the most commonplace objects in life. We move for years among old, familiar things without giving them a passing thought, when all at once some subtle spell is cast about them, and they become vested with a charming interest. I have tramped many times through autumn woods and picked off the "stickers" with no good will, but to-day they strike

me as more than "stickers." I have discovered an old friend among them. Withered and brown, I should scarcely have recognized the friend of my springtime rambles but for a certain odor of the roots and a sprig of young green leaves by the side of the old, dry stalk. It all comes back now—sweet cicely of the spring woods with its umbels of white blossoms and that sweet, aniselike smell of its roots. To discover an old friend in a strange guise is enough in itself to whet one's interest, and I have curiosity to know how sweet cicely fares in the undertime of the year. All through the woods I find the dry, leafless stalks of the plant adorned with slender, black seed-pods that cling in pairs to the delicate pedicels of the umbel clusters. Under a magnifying lens each pod reveals a structure of wonderful design, the sole purpose of which is to fasten on to any object that may brush past. To this intent it is furnished with delicate hooks, arranged in parallel lines along its sides, lying close against the pod and pointing back from its free end. The free end of the pod tapers into a slender style armed with the same hooklike structures, so that whatever part is touched it will be sure to cling fast.

Another umbelwort, the fruit of which catches on to the clothes in our autumn woodland walks, is sanicle or black snakeroot. We come upon it in the undergrowth of hillsides and in the dry woods of the uplands with its small, brown burs bunched in clusters on the ends of the branching stem. It grows scarcely higher than one's knees, and in the tangled mass of brown and green is often passed unnoticed. Each little bur presents an array of minute hooked bristles, set closely together, and forming a most effective means for attachment to the hairy covering of animals.

The various species of *Desmodium*, or tick trefoil of the pulse tribe, are among the most persistent "stickers" of the October woods. The flattened, several-lobed pods are more familiar to us as clinging in detached lobes to our clothes after coming out of the

woods than when hanging from the branching tops of the slender, wandlike plants. It is seldom that a complete pod is found, for the deeply cut joints of the one-seeded lobes need only a gentle pull to break them. The lobes have a raspy feel, and a pocket lens shows their flat sides to be thickly covered with minute, curling hairs, and few "stickers" are harder to pull off than those of the desmodiums, since they cling closely by their whole surface to any woolly substance.

A group of "stickers" that frequently adorn the wanderer through autumn woods are those of the bedstraw or cleavers of the genus *Galium*. In some of the species the low, trailing stems and their leafy branches are roughened with small, hooked bristles, while in others, as in the common cleavers, or robin-run-the-hedge, the fruit also is thus armed and adhesive. *Circæa*, the enchanter's nightshade, that grows so abundantly in the depths of cool, moist woods, contributes a large share to the motley collection of "stickers," its small, burlike fruit being covered with tiny, hooked prickles. So in the species of comfrey, or hound's tongue, the nutlets are rough-coated with an armament of short barbs and hooks that fasten themselves to the wool and hair, and are very troublesome to sheep that stray into the copses along the pasture side. The fruit of one species, familiarly known as "beggar's lice," is one of the most annoying pests of the woods, and Gray, at the end of his technical description of the plant, calls it "a common and vile weed."

Among the *Compositæ* there are comparatively few plants which effect their dispersal in this parasitelike way, most of the forms developing the characteristic downy structures known as pappus, like the dandelion and the thistle, that float their seeds away on the wings of the wind. Some species, however, like the bur-marigolds, have fallen into the parasitic mode of dispersal, and these are mostly plants of the low, tangled thickets along streams and in swampy places. The many-flowered heads of the bur-marigold ripen in the

fall into numerous flattened seedlike bodies, or achenia, each one of which is crowned with two or more stiff, needlelike, and barbed awns. Few "stickers" are more annoying than these "beggar's-ticks" of the bur-marigold. There is not a patch of low tangle that is not full of them, and one can scarcely pass by such places without bearing away a closely clinging horde of the pests. In the drier woods of the uplands a familiar species of bur-marigold is abundant, with longer and more slender achenia, which are known as "Spanish needles."

Among the larger burs that gather on us in the fall are those of two composite plants —the burdock and the cocklebur. They are both weeds of waste places, coarse and ill-looking, springing up in rank abundance about pigpens, barnyard fences, and the dump heaps of open lots. The redeeming virtue of the burdock is its purple flower heads crowning the bristly green involucres, which in childhood days were plucked to make "buz-baskets." The larger and coarser cocklebur, with its armament of strong hooks, is another of Dr. Gray's "vile weeds," wrapping itself inextricably among the hair and wool of the dog or sheep that unwittingly strays into its domain.

The fruit is the vehicle of the seed, and in each seed lies hidden the germ of a new plant. To spread itself as far and wide over the earth as its environing conditions will allow is the aim of every plant. In some the fruit has developed into an edible berry, and the hard-coated seeds pass uninjured through the bodies of animals, and are scattered long distances away from the parent plants. In many forms it is fashioned for sailing in air currents; in some, like the cocoanut, with its tough, buoyant husk, to be floated on the waves and washed by the tides and ocean currents to distant shores. Every plant tends to hold back this dispersive effort until its seeds have matured. As this is accomplished the ovary ripens into the fruit, of a form and fashion after its kind. The green color, that served to protect it when ripening amid the mass of foliage, changes to the conspicuous reds and yellows that catch the eye of a wandering animal—and so its part is played. Among these burs and "stickers" of our autumn woodlands we see but another means for securing this end. The wandering deer or bear, the hunter following its trail through the undergrowth, the fox, skunk, raccoon, and such lesser wood folk, each serves a turn in bearing away these bristly fruits. How well it has been accomplished is seen in the wide dispersal of these plants. A striking fact in evidence of this is the relatively large number that have come from the shores of Europe as uninvited guests. Circæa, the burdock, cocklebur, several species of cleavers, and a species of comfrey have thus become naturalized in our country, and it is not improbable that several of our native species have found their way to the Old World by catching fast to some passing vagrant, who later took ship and landed with the burs still clinging to his clothes.

Reproduction and dispersal are the two great aims in the life of every plant and animal. All else is but the means, the mere contrivances to gain the best advantage in the accomplishment of these

ultimate efforts. Every species, every individual exists by virtue of having striven to attain these ends. In the structure of each one is the record of the attainment, partial or complete, as the case may be. And each man and woman of us is toiling in his or her way toward the same goal, unconscious of that something within us, greater than ourselves, that "guides us, blindfold but safe, from one age on to another." The burs and "stickers" that cling so persistently to our clothes are but a part of the same great effort. It is the only way sweet cicely, desmodium, the bur-marigold, and their kin have of traveling through the woods, and so on from forest to forest, from swamp tangle to swamp tangle. They live their lives as truly as a man lives his, with equally as good a purpose that is equally as well attained. Each embodies those essential qualities of living that the great teacher discerned when he bade men "consider the lilies of the field."

EXPERT TESTIMONY IN THE BERING-SEA CONTROVERSY.

By Prof. T. C. MENDENHALL.

THE intelligent public, fickle and uncertain as it is, has apparently not entirely withdrawn its interest from one of the most important and suggestive of modern diplomatic entanglements, the Bering-Sea controversy. Although thought to have been finally settled by arbitration in 1893, the Paris award seems to constitute only the beginning of a new phase of the subject. The valuable investigations and interesting reports of the last American commissioner, Dr. Jordan, and of his English colleague have seemed to keep the matter alive in the public mind, and to the interested and informed reader they have furnished a fresh example of that curious tendency among scientific experts to come to conclusions diametrically opposed to each other, although starting with essentially the same data. Of course, everybody knows that it is essential to the proper carrying on of a scientific investigation that it be commenced with no preconceived notions as to how it is coming out, and that judgment should wait on fact, ever ready to incline this way or that, in obedience to the compelling laws of thought. Justice to the man of science obliges the admission that, take him in his laboratory or library, with no end in view except that of getting at the truth, he generally lives fairly well up to this high standard, and easily, too. But transform him by the magic influence of a handsome retainer, or any other like incentive, into a *scientific expert*, and he is a horse of another color. He must now assume a certain theory to be true,

and use his experience and skill to convince others that the assumption is sound; he must also be able to discredit and put to shame another scientific expert who is doing the same thing for the other side. This is not an overstrong statement as applied to the greater portion of modern scientific expert work as utilized in legal controversy. Generally one and often both sides in such a controversy will hope to avoid a full exposition of fact or a clear presentation of the whole truth; and just as the able lawyer receives emoluments far beyond those of the abler judge, the expert witness who can prove his case is made much more comfortable in this world than one who sees all sides and no side, but only the truth. Men of science must not be held entirely responsible for this condition of things, however, for they have long and strenuously urged a change in the system to which it is due. Nor must it be assumed that any special moral obliquity exists in such cases, for always and everywhere judgment is unconsciously influenced by personal interests.

It has not often happened that men trained to scientific methods of investigation and modes of thought have been called upon, on that account, to take part in diplomatic negotiations. Indeed, there is at first blush something ill-fitting about such an arrangement, for the word "diplomacy" in theory and in practice, as well as in the dictionary, stands for a certain "dexterity or skill in securing advantages," for which there is no real use in science.

The dispute with Great Britain over the Alaskan seal herd has given opportunity for the utilization of scientific training and expert knowledge in the determination of the fundamental facts and conditions upon which the whole question should turn. The conclusions regarding these facts and conditions which have been reached by the several investigating commissions appointed by the two great powers involved are so different and so directly opposed to each other that a review of the work of one of them ought to be of general as well as special interest.

For this purpose it is not necessary to present a historical narrative of the origin and growth of the sealing industry at the Pribilof Islands under the direction first of Russia, and since 1867 of the United States; nor to trace the beginnings of the international dispute concerning the right to control the taking of seals from the water, either in Bering Sea or in the North Pacific Ocean. It is well known that after the Executive of the United States Government, supported by Congress, had for several years assumed the right to prevent pelagic sealing in Bering Sea, vigorous protest was made by Great Britain, and that there resulted the agreement upon the *modus vivendi* of 1891, and the concurrence on the part of the United States in the proposal of the British Government for "a

reference to a joint commission to ascertain what permanent measures are necessary for the preservation of the fur-seal species in the northern Pacific Ocean." The provisions of the treaty referring to this commission were as follows:

"Each Government shall appoint two commissioners to investigate conjointly with the commissioners of the other Government all the facts relating to seal life in Bering Sea, and the measures necessary for its proper protection and preservation. The four commissioners shall, so far as they may be able to agree, make a joint report to each of the two Governments, and they shall also report, either jointly or severally, to each Government on any points upon which they may be unable to agree."

On June 24, 1891, Sir George Baden-Powell, M. P., and Dr. George M. Dawson were appointed as commissioners for Great Britain, and on July 10th Dr. C. Hart Merriam and the writer of this article were designated to serve the United States in a like capacity.

It will be seen above that the duty of these commissioners was primarily the ascertainment of facts, together with the recommendation of such measures as in their judgment were necessary for proper protection and preservation of seal life in Bering Sea and the northern Pacific Ocean. It is important to note, also, that in the letter of instructions of the respective powers to their commissioners this was emphasized as the "main object of the inquiry." In the letter of Lord Salisbury to the British commissioners they are instructed that their principal duty will be to ascertain "what international arrangements, if any, are necessary between Great Britain and the United States, and Russia or any other power, for the purpose of preserving the fur-seal race in Bering Sea from extermination." He further says: "I need scarcely remind you that your investigation should be carried on with strict impartiality, that you should neglect no sources of information which may be likely to assist you in arriving at a sound conclusion, and that great care should be taken to sift the evidence that is brought before you.

"It is equally to the interest of all the Governments concerned in the sealing industry that it should be protected from all serious risk of extinction in consequence of the use of wasteful and injudicious methods."

It will be remembered that the correspondence relative to the joint commission was concurrent with that in which the proposed arbitration treaty was discussed; and, indeed, it was only on the signing of that treaty that the commissioners were to become endowed with full authority for joint consideration and report.

The American commissioners were especially instructed by the

Secretary of State that with questions relating to the exercise of exclusive jurisdiction by the United States for the protection of seals they had nothing to do, and that they were "not authorized to consider or discuss them." Their function was especially restricted to the consideration of facts, causes, and remedies as suggested in the treaty quoted above.

It thus appears to have been clearly the intention of both Governments to regard the commission as one organized purely for the ascertainment of facts and the recommendation of such remedies and regulations as would be suggested by the facts. There is no assumption of any diversity of interests in the matter; the problem is submitted to the commissioners as it might have been if the whole affair had concerned the United States alone, or Great Britain alone. Certain methods of taking seals, at sea and on shore, are followed; it is claimed that these methods, one or both, or other causes are accomplishing the extermination of the herd; the commission is to investigate all the facts, and if it concludes that the herd is in danger of extermination it is to suggest such regulations as it may agree upon for its preservation—not a word or a hint about national or international or traditional rights or "compensatory provisions."

It is of the utmost importance to note these facts, as they appear in the letters of instruction to the commissioners, for they are the basis of the assertion, which might as well be made now as later, that the American commissioners alone, and from the beginning, considered the subject from a scientific or judicial standpoint, while their colleagues, also from the beginning, treated the problem as if it were diplomatic in character, not omitting an occasional attempt to use "dexterity and skill in securing advantages." A small part of the evidence available will suffice to make good this possibly extreme statement, and in attempting to do so it must be understood that not the slightest reflection upon the distinguished gentlemen, who so ably represented and maintained what they believed to be the best interests of the British Government, is intended, or criticism of the course which they followed during the conferences; it is only meant to draw attention to the fact that they were in the attitude of the expert witness whose vision and judgment are undeniably, though unconsciously, influenced by the necessary demands of a previously accepted hypothesis. It is extremely likely that they have precisely this view of their American colleagues, and it is with a view to a fair adjudication of this question that the facts are herewith submitted.

To begin with, there was necessarily a difference in the state of mind of the two commissions in approaching the problem, due to the fact that the British commissioners had already made public ex-

pression of their views upon the subject, in which they made positive declarations of opinions already formed upon nearly, if not quite, all questions at issue, and this before they were even appointed as commissioners. This fact was made the subject of a note by Mr. Blaine to the British minister, on February 6, 1892, and was discussed in a reply by Sir Julian Pauncefote. On the other hand, the American commissioners had taken no part in the current discussion, and, as a matter of fact, had been for several months prior to their appointment engaged in professional work in regions of the country remote from newspapers or telegraphs, and were entirely ignorant of the remarkable wave of public excitement and anxiety by which the country had been swept in consequence of the rather stirring diplomatic correspondence which had been going on. Without returning to Washington, or in any way coming in touch with the generally prevailing irritation due to the attitude of Great Britain, they proceeded to Bering Sea and the Pribilof Islands, having only in mind that they were charged to investigate "the facts having relation to seal life in Bering Sea, and the measures necessary for its proper protection and preservation." They were accompanied in their investigations by the British commissioners, to whom every facility for a thorough study of the situation was accorded. Rookeries were visited together, abandoned beaches were examined in their company, and as far as could be all data from which conclusions might be drawn were made the common property of both commissions. The evidence of great diminution in the number of the seals herding upon the islands seemed to be overwhelming, and much of it, especially the physical condition of the rookeries themselves, was quite independent of human testimony; natives and Government officers who had resided on the islands for many years were practically unanimous in their opinion that the herd was being destroyed. The attention of the British commissioners was called to the unmistakable evidences of depopulated breeding rookeries and deserted hauling grounds, but there were early indications that they were looking for support for a hypothesis carried with them to the field of observation. After considerable "joint and several" investigation, the commissioners separated, to meet again in conference for the preparation of a report early in the year 1892.

It is not necessary to enter into the details of the extensive observations and studies which led the American commissioners to conclude, first, that the number of seals was rapidly diminishing; second, that the principal cause of this diminution was and had been pelagic sealing; third, that the only effective remedy was the complete cessation of taking seals at sea. Their report, published as a part of the case of the United States, may be referred to by those who wish to

know more thoroughly the situation as it presented itself six years ago. It is a satisfaction to know that every assumption which they made has been justified, and every prophecy in which they indulged has been fulfilled by subsequent events.

From the beginning they sought to have the conference at Washington conducted upon the assumption that all political or international questions, rights, or privileges should be ignored; that facts should first be determined, causes got at as far as possible, and remedies proposed, as if an individual were the sole arbiter of the question, and the benefit of the whole people only considered. In fact, at one stage of the conference the following question was submitted as a possible means of clearing the way to what seemed to the Americans to be the real function of the joint commission: "Suppose that one individual controlled the whole matter of killing seals on the Pribilof Islands, in Bering Sea, in the North Pacific, and wherever any of this herd of fur seals are found during their entire life, and suppose that the end in view was to so conduct the killing that the largest possible number of commercially valuable skins could be obtained every year perpetually—that is to say, that the owner or controller would be forever benefited in the highest degree by the existence of the herd; under these conditions, what would be the best method of killing—by hunting at sea under the most perfect and complete regulations and restrictions that are possible, or by killing males only on land under the most perfect and complete regulations and restrictions that are possible?"

But from the start it was evident that the British commissioners were determined to discuss and consider all questions from a diplomatic and political standpoint. There was to be difficulty in agreeing upon conditions; greater difficulty in determining causes; and practical disagreement as to remedies. At the very first conference strong objection was urged against a part of the letter of instructions which the Secretary of State had communicated to the American commissioners, and which they, in turn, communicated to their British colleagues, receiving in exchange the instructions sent by Lord Salisbury. The obnoxious paragraph was that in which the American commissioners are informed that they need not concern themselves with the question of "the exercise of complete jurisdiction by the United States for the protection of seals," it being declared that this made it impossible to consider matters relating to the manner of taking seals upon the Pribilof Islands. This assumed obstacle to a full discussion of the problem threatened to interrupt and delay the conferences, notwithstanding the repeated declaration of the Americans that it did not exist, and it became necessary to suggest that there seemed no occasion for concern on the part of the

British commissioners on account of the character of instructions received by their American colleagues, at least not until the latter declined on account of such instructions to consider any question at all related to the work of the commission. The incident is referred to only as one of many evidences of a tendency to avoid the simple line of scientific inquiry upon which it had been hoped the commission might work; and, further, that it may be recorded that throughout the entire life of the commission the representatives of the United States were absolutely free and unhampered in the exercise of their personal judgment, not only as to the scope of their powers but as well as to the attitude which they assumed on any question coming before them.

A preliminary basis of agreement had been prepared and was submitted by the Americans at the first conference. Its first proposition was a simple declaration of the decadence of seal life in Bering Sea. It had hardly been suspected that there could be serious difference of opinion on this point, but there was an unwillingness to go on record as believing that the herd was greatly declining in numbers, except in the most guarded manner. It was even affirmed by the British commissioners that there was evidence to show that the number found on the islands in the season of 1891 was greater than in 1890.

The second proposition submitted was a declaration that this decrease in the number of seals frequenting the Pribilof Islands must be attributed largely, if not wholly, to pelagic sealing. This involved the gist of the whole controversy, and in support of it the American commissioners offered the now well-known facts regarding the natural history of the seal, the inevitable results of sealing at sea, the impossibility of perfect control of land killing, the silent but unimpeachable testimony of skins marketed by pelagic sealers, and other evidence, the strength of which time has served only to increase. There were certain facts of profound significance as affecting this question which it seemed impossible to controvert. An animal whose period of gestation is about one year, and which gives birth to but a single individual, belongs to a species not likely to multiply with great rapidity, even when left to contend only with its natural enemies. Add to this the admitted facts that the two sexes are equal in number at birth, and that polygamy is universal, only one male being found on the breeding rookeries for every fifteen or twenty females, and it follows with a certainty rarely met with in discussions of this kind that the preservation of the herd depends upon the preservation of the female, and that a very large proportion of males may be taken annually without affecting in any way the number born. Had a good set of "mortality tables" for seals ex-

isted, such as have long been available for men, it would have been easy to calculate just what number of males of fixed ages might be killed annually without interference with the reproductive power of the herd, and computations of this character were made and submitted by the American commissioners, based upon the best available data, showing that the average number taken upon the Pribilof Islands during the past twenty years could not have been greatly in excess of safety.

But in sealing at sea discrimination as to sex is impossible. It was affirmed that by far the greater number of seals killed at sea were females, an assumption justified by an examination of the skins of a large number of seals taken from the water, as well as by other evidence not less conclusive, though more circumstantial. Indeed, the British commissioners admitted that at least one half of those killed at sea were females, making it extremely difficult to understand how they could argue themselves into the belief that the herd could ever reach its maximum dimensions while pelagic sealing existed, or why the growth of the latter would not necessarily lead to its practical extermination. Finally, it was submitted that if the truth of these two propositions was agreed upon it was impossible to avoid the following conclusions: That the restoration of the sealing industry to its normal condition, so far as relates to the Pribilof Islands, requires the entire cessation of killing, both on the islands and at sea, for a period of years not less than five, and to be extended if competent examination of the rookeries so indicated. When killing was resumed it should be restricted to selective killing on land, under the most rigid inspection, and pelagic sealing should be perpetually prohibited.

In submitting these propositions as the logical outcome of the facts as determined, the American commissioners were adhering to both the letter and spirit of the convention, in which they were directed to investigate and report upon "the measures necessary for the proper protection and preservation" of seal life. They did not believe it to be their duty to consider how such measures would affect the interests, business or political, of the subjects of either or any nation. They believed with Lord Salisbury that it was "equally to the interests of all the Governments concerned in the sealing industry that it should be protected from serious risks of extinction," and that the discussion of compensatory measures, equivalent adjustments, methods of enforcement, etc., was not the duty of a commission organized to ascertain facts and conditions, determine causes, and suggest remedies. They also fully realized that they were tolerably certain to be thought ingenious rather than ingenuous, because the remedies which they suggested were apparently

and perhaps in the end really in the interests of the country they represented, although, in their judgment, in the end equally in the interests of the great nation represented by their colleagues.

A lengthy discussion followed this presentation, filling much of the time of the seventeen sessions of the conference, which extended through February and a part of the first week in March, 1892. The British commissioners were unwilling to admit that pelagic sealing was the main or even a principal cause of the diminution of seal life, for which they argued that killing on the islands was most largely responsible. It was even asserted that if taking on the islands was entirely discontinued all the pelagic sealing that could or ever would be carried on in Bering Sea and the North Pacific would never lead to the commercial extinction of the seal herd. Such an assertion made necessary others of an equally extraordinary character, such as that the killing of females at sea to the extent of furnishing one half of the pelagic catch, as they were compelled to admit, should be considered as a desirable and wholesome treatment of the herd, not tending in any way to reduce the total available product. They affirmed that the percentage of seals lost in pelagic sealing was very small, being much less than that by improper killing on the islands. They accounted for the very large excess of skins of females in the pelagic catch by declaring that during the past few years frequent raids upon the islands had been made, in which crews of sealing vessels descended upon the breeding rookeries at night and captured the females in large numbers. The small size of the islands and the presence of numerous guards near the principal rookeries rendered such an assumption practically impossible, and, although occasional raids have occurred, the poachers have always preferred the hauling grounds of the male seals, whose skins are more valuable than those of the females. It was generally believed by residents of the islands and Government inspectors that the number of skins obtained by this kind of poaching was extremely small. The presence of large numbers of dead "pups" or young seals, which was attributed by the American commissioners to starvation owing to the death of their mothers at the hands of pelagic sealers, was charged by the British commissioners to other causes, some form of disease or epidemic being the favorite.

Differences so radical as to causes were naturally accompanied by equally radical differences as to remedies. On the one hand, it was contended that as pelagic sealing was in the largest measure responsible for the evil, its entire suppression ought to be recommended; on the other, that pelagic sealing had comparatively little to do with it, and that severe restriction on the number killed on the islands, with perhaps a small closed area surrounding each, would

arrest any diminution in numbers and restore the herd to its normal condition. For an area of protection perpetually closed to pelagic sealing, the British commissioners suggested a zone about each island ten miles in width. When it is remembered that the two principal Pribilof Islands are each about a dozen miles long and nearly half as wide, and that they are approximately distant forty miles from each other, the utter inadequacy of such a suggestion is at once evident. To the consideration of a closed time during which *all* sealing at sea should be prohibited, they were not at all inclined, except it were so limited as to be practically valueless. They strongly urged the recommendation of a scheme in which it was assumed that some sort of a relation might be established between the number of seals permitted to be killed on the islands and the pelagic catch. This relation was to be elastic and compensatory, and its advocacy logically compelled the extraordinary declaration that sealing at sea could be as vigorously and exactly controlled and restricted as sealing on land.

In short, it became more and more evident every day, as the conferences continued, that the representatives of the people who were engaged in pelagic sealing were set upon opposing any recommendations looking either to its destruction or to its serious curtailment. Apparently the question was not so much How will this measure or that affect the vitality of the seal herd? as How will it affect the profits of this nation or the losses of that? The possible preservation or destruction of a useful and rare species was lost sight of in the consideration of immediate gains, compensatory regulations, equivalent shares, etc. The American commissioners, while not unwilling to discuss all proposals to limit and control sealing, both on land and at sea, became so thoroughly convinced that there was but one efficacious remedy that they felt compelled to reject all schemes of improvement in which that was not insisted upon. Indeed, nothing else was offered or considered which, in their judgment, gave even small encouragement of success in actual practice.

Under these circumstances it was only possible to agree to disagree. A very brief joint report was finally settled upon and drawn up, in which the only conclusion of any importance whatever was a most cautious and circumspect declaration that there had been a diminution in the number of seals annually resorting to the Pribilof Islands, and a hesitating admission that "man" must be held responsible for it.

It is worth noting that during the entire conference there was a singular anxiety and desiré on the part of the British commissioners to secure from their American colleagues some formal admission regarding or recognition of pelagic sealing as a legitimate mode of

taking seals, and one not inconsistent with the continued preservation of the herd in normal extent. The several methods by which this was sought to be accomplished were striking illustrations of how far the work of the joint commission departed from the lines along which it was originally laid out, leaving the region of scientific investigation for that of partisanship and diplomacy.

As every one knows, the whole question with the joint and separate reports of the commissions went to arbitration before the tribunal at Paris in the summer of 1893. The report of the American commissioners was completed and submitted about the middle of April, 1892; that of their British colleagues was received by Lord Salisbury on August 14th. These dates are significant. In recent diplomatic correspondence relating to the present state of the controversy there has appeared a vigorous protest against a policy of delay in submitting reports which were to be simultaneous or concurrent, and it has been plainly intimated that advantages are expected to accrue from such delay. This is but history repeating itself. The strictures of Messrs. Phelps, Carter, Blodgett, and Coudert, counsel for the United States in 1893, upon the great and unjust advantage taken by the Government of Great Britain in this way might furnish useful, if not interesting, reading for some of the severer critics of the recent action of the Department of State.

The Bering-Sea arbitration, with its disastrous consequences to the sealing industry, can hardly be referred to with satisfaction by those who so earnestly desire the reference of all international disputes to similar tribunals. It serves, however, as an excellent illustration of the fact that international arbitration is now and must be for a long time little more than an elaborate and costly means of reaching a compromise. The Paris award gave to the United States somewhat more protection of seal life than Great Britain had offered through her commissioners, but vastly less than was asked as necessary and just. The British commissioners had suggested a protected zone about the islands of ten miles width, and were willing to consider a close season during that period in which pelagic sealing is unprofitable; the arbitration tribunal gave a zone of sixty miles and a close season of possible consequence, if only it could be enforced, together with a few minor restrictions which have proved to be of really little value. It is difficult to find a compromise between life and death, and even so dignified and learned a body as the Paris tribunal failed in this instance. The experience of three or four years has shown the signal failure of the remedies proposed. And this must not be attributed alone to the lack of perfect application of these remedies. The United States has maintained a fleet of Bering-Sea police at once efficient and expensive. Great Britain

has naturally done as little as could well be managed to aid in the enforcement of the arbitration decree, and indeed how could the most sanguine millenarian, with any knowledge of national history or traditions, imagine that the British navy would be spurred to great activity in running down schooners flying the British flag, manned by British subjects, while engaged in the profitable pursuit of an industry which another nation claims as its own?

During the past two years, under the efficient direction of Dr. Jordan, elaborate investigations, including something like an actual count, have been made to ascertain the number of seals frequenting the Pribilof Islands. Other studies have strengthened the conclusion that the number has greatly diminished within the past decade, and is now greatly and rapidly diminishing. In spite of the regulations of the Paris tribunal pelagic sealing has increased enormously, while legitimate killing upon the islands has been largely discontinued. That was a charming thrust of Lord Salisbury's when he said that the English interest in the fur-seal industry had for some years exceeded the American, for it is beginning to be apparent that while the Americans have busied themselves arranging for arbitrations, seeking international co-operation, and organizing scientific commissions to prove again what had been proved before, their sleepless adversaries were quietly gathering in the profits, realizing that the business must soon be closed up anyhow. In the report of 1892 the British commissioners had no intention of indulging in humor when they suggested as one of the most desirable measures the setting apart of at least *one* of the two seal islands entirely for the purpose of breeding seals for pelagic sealers, no land killing to be allowed there.

Is it not time for the people of the United States to ask whether the game is worth the candle? Two considerations call for the preservation of the Alaska seals, the sentimental and the commercial. The former may be dismissed, as it has been in cases of far more intimate contact between man and the species exterminated. The commercial consideration is one that ought not to be difficult to deal with. In fact, *all* are agreed that the "preservation" of the fur-seal species is important to mankind, and it is only necessary to determine *how* important or how large a proportion of mankind is deeply concerned in this. If the continued existence of any industry or material product is of extreme importance to the comfort, health, or general well-being of a large part of mankind, extreme measures may justly be resorted to to insure its permanence. It is not difficult to imagine conditions under which the care and preservation of the buffalo might have been forced upon the people of the United States, wisely and justly.

The first part of the argument of the American counsel before the Paris Arbitration Tribunal consisted of a most suggestive half-dozen pages, prepared by Mr. James C. Carter, in answer to the question, "What law is to govern the decision?" Mr. Carter declares that it must rest upon *international law*, which he defines as the "general standard of justice upon which civilized nations are agreed." This standard is fixed neither as to time nor place, and depends largely on the character of the interests involved. Existing as law without legislation, it controls and influences governments much as public opinion influences individuals. Indeed, international law may be considered as *the public opinion of nations*, and like other public opinion it may be depended upon to support extreme measures in extreme cases.

If the claim of the United States regarding the evil consequences of pelagic sealing are valid, and its absolute prohibition the only means of preventing the annihilation of the fur-seal species, the method of treatment adopted in 1886 and 1887—being, in fact, that followed by the Russian Government for many years—would be entirely justifiable, provided the value of the species to mankind was so great as to bring to such a policy the support of the public opinion of nations. It is now too late to discuss this question, however, for the nation is in honor bound to respect and abide by the Paris award, no matter how unreasonable and inadequate it may be. It is difficult to see what good will come from further discussions, investigations, or declarations. Until the regulations adopted at Paris are "abolished or modified by common agreement between the Governments of the United States and of Great Britain" they must stand.

Great Britain appears to be well satisfied with them, and ought to be if they have so affected legitimate sealing on the islands that "English interests in the fur-sealing industry now exceed American."

The heroic treatment resting on asserted exclusive jurisdiction and property rights, the basis of which was so strongly argued by Mr. Justice Harlan and Senator Morgan at Paris, is now estopped by the denial of such jurisdiction or rights in the decree of the tribunal appealed to. The artifice of branding female seals, which was to be resorted to extensively during the current season, will in no way diminish the number taken at sea, for the brand can be found only after the seal is killed, and it can not injure the skin enough to make the business unprofitable. Besides, it is an expedient hardly worthy the dignity of a great nation. Is it not the part of wisdom, then, to accept the situation? Already the cost of maintaining the struggle, the expense of commissions, policing fleets,

arbitrations, etc., has been enormous; on the other side of the account is the comparatively small tax on the few thousand skins taken on the islands since 1890, to say nothing of possible large payments of damages to the lessees for loss of profits on account of a forced diminution in the catch. With the present attitude of Great Britain, the practical extermination of the herd in the near future seems assured. The United States may have the pick of what remains by wholesale killing on the islands; further international irritation will be avoided, and an episode which has brought into strong relief certain national traits on both sides will close with at least one interesting result: it will be impossible to know absolutely which group of scientific experts was right in regard to the effects of pelagic sealing.

NATURAL AND ARTIFICIAL PERFUMES.

By M. JACQUES PASSY.

WE may divide the makers of perfumes into the two classes of those who furnish the raw materials for perfumery and the manufacturers proper. The former provide the essences, the pure or concentrated scents, and the latter mix and extend them, incorporate them into various liquids or pastes, and offer them for consumption. Another division, of recent occasion, may be made between those who extract natural perfumes according to the methods pursued for centuries and those who use chemical processes or make artificial perfumes; for, as dyestuffs are now composed from coal-tar products to the extent that some of the natural materials have been driven out by artificial substitutes, so a number of perfumes have been in like manner synthetized. But there is no probability that the synthesis of perfumes will ever be carried to the extent of which that of dyes seems capable, because, first, some essences are the raw material for the synthesis of artificial products of much greater value; and, secondly, the chemical problem of the synthesis of perfumes is more complicated than that which enters into the artificial production of coloring matters.

The preparation of natural essences is still a genuine agricultural industry. Flowers and leaves are the raw material, and they have to be treated fresh. The original laboratories are therefore generally established very near where the plants can enjoy the most favorable climatic conditions. Hence the crude essences generally come to us from various distant regions—essence of ilang from Manilla, of geranium from Réunion and Algeria, of lemon and citron from Ceylon and China, etc. But as the imported materials

are generally scandalously adulterated, European manufacturers have been impelled to bring home such of the crude material as will bear transportation. So sandalwood, cloves, patchouli leaves, and vetivert-grass roots brought dried and with their scents unimpaired are distilled in France and Germany rather than in the countries of their origin.

The most important center of this manufacture is the little city of Grasse, near Nice and Cannes, which, besides being a large center of production for the distillation of plants and woods, is the chief place where these special processes which have been transmitted through ages and are the only ones for the extraction of the perfumes of flowers are in use. The only chemical agents employed in these processes are vapor and fat.

The manufactories of artificial perfumes, on the other hand, are real laboratories of chemical products where the habitual agents of chemical industry are employed, requiring the intervention of chemists and engineers, and are established by preference at the great industrial centers. Hence good reasons exist for these two branches having been kept apart, although it is not certain that this separation will continue permanent.

The simplest process of extraction is by distillation. The flowers or leaves are put into the retorts with water and heated to the proper degree. The perfume passes over to the cooling apparatus with the vapor of the water and is condensed with it, after which it is separated from the water by taking advantage of the difference of density. The heat is applied by means of vapor under pressure. Formerly fire was applied directly, but the amount of production was insignificant compared with what it is now; this method is, however, still in use in small portable apparatus. Some distillations are literally performed on the spot, as those of certain aromatic plants which are not grown very near Grasse, the finer lavenders especially being found wild at considerable heights on the mountains. The communal lands up there are allotted every year, and extractors who make this a specialty establish themselves in their plots with their direct fire apparatus, expecting to dispose of their production to the large houses.

When the quantity produced is regarded, distillation is the most important branch of the perfumery industry. It is simple, inexpensive, requires but little manual labor, and is applicable to large quantities of material. But there are objections to it, and some of them are of so much force as to have led to the substitution for it of seemingly more primitive, and at all events more expensive, methods of extraction. The first objection is the liability of vapor, coming in contact with some of their more unstable constituents,

to change the character of some of the essences. A still more important objection is that the vapor may bring over some undesirable constituents existing in the plant, or by its action on some of the constituents may produce new substances in no way allied to the perfume. Impurities produced in this way communicate to the newly distilled essence what may be called the taste of the retort. Such inconveniences, of relatively little account in the coarse extracts, are very important in the more delicate distillations.

A process used at Grasse for conserving the more delicate qualities of the perfumes, and which constitutes a method original to the Maritime Alps, consists in the employment of grease for the composition of perfumed pomades. A grease of suitable consistence which will not become rancid is obtained by preparing a mixture of lard and beef fat and subjecting it to thorough refining processes. The perfume is incorporated with this base by a process of warm maceration, or by absorption.

For maceration the fat is melted in the marine bath and brought to a temperature of 60° or 70° C., as measured by the skill of the attendants rather than by the thermometer; the rose leaves, or whatever is to be treated, are introduced, thoroughly immersed; after a few hours the mixture is passed through strainers and drained, so as to separate the grease from the flowers as completely as possible. What grease remains on the rose leaves is washed off with warm water. The process is repeated with the same grease and with other flowers, and so goes on for fifteen or twenty days, according to the quality of the pomade that is desired. Some of this pomade is consumed as it stands; but by far the greater part is used for making extracts, or alcoholic infusions of the perfume. For this purpose the pomade is introduced with a suitable quantity of alcohol into a shaker, consisting of a cylinder in which a screw beater is kept going all the time. The mixture is thus actively beaten up, and, as the perfume has more affinity for the alcohol than for the grease, the grease in time becomes nearly inodorous, and the alcohol is charged with the greater part of the perfume. The grease is then sent to the soap maker, for it is not fit to be used again for a pomade.

The question may be asked, and has been asked, Why use the intervention of grease in the process of extraction? Why not apply alcohol or some substance of similar powers directly? Chemists have offered ether, sulphide of carbon, chloride of methyl, chloroform, and other scientifically prepared solvents, to have them rejected, and have blamed the manufacturers of Grasse for adhering to barbarous processes, and for their inability to escape their antiquated routine. A more scientific spirit would lead them to inquire

if there were not some reason for preferring grease. Most of the substitutes recommended have more liberal affinities than grease. Alcohol, for instance, unites readily with water, and with water takes substances held in solution by it, which are extremely undesirable in a perfume; and so with the other substances, according to their several properties. Grease has a narrow elective affinity, and takes just what is wanted and nothing else. Various petroleum substances have been proposed recently as extractors, and much may be said *prima facie* in favor of them; but experiments with them have not yet given satisfactory results.

In the process of absorption or *enfleurage* wooden frames furnished with glass bottoms are used. These, fitting closely together, are placed one upon another, so that a small inclosed space is left between every two of them, or a sort of greenhouse with glass above and below, inclosed with wood. The surfaces of the glasses are coated with grease, on which a layer of flowers is placed. The flowers are left there to shed their perfume, which is absorbed by the grease, for twenty-four hours, when they are removed and new flowers are put in their places. This is continued for two or three months, at the end of which time the pomade is ready for treatment as in the maceration process. The flowers to which this process is best adapted are the jasmine, tuberose, and mignonette. This *enfleurage* process has likewise drawn criticism, if not contempt, from men of science; and the question has been asked why a different treatment is given to these from that pursued with other flowers.

If we observe flowers with regard to their odors, we shall find that they may be divided into two categories: those which contain their perfume already formed, or have at least a considerable reserve of it, and those which have no reserve, but develop and emit their fragrance as they grow. When we rub roses or orange blossoms, for example—flowers of the former class—we perceive their fragrance very plainly. Such flowers may be treated by distillation, by the warm pomade process, or by extraction with volatile solvents, with results of a greater or less degree of perfection, but always positive; while if we rub a flower of jasmine, convallaria, or violet—which are of the second class—we perceive nothing but a slight pungent odor in the same plant which an instant before was exhaling a pervading fragrance. In crushing it we have killed it, and it produces no more perfume. Such flowers are not suitable for distillation or maceration or the action of volatile solvents, because there is nothing to be extracted from them.

The production and exhalation of odor go on while the plant continues to live and vegetate, even after it has been cut. When, therefore, it is placed in the limited atmosphere of these absorbing

cases, the perfume continues to be given out, and is absorbed by the grease. Contemplating the matter from this point of view, we are astonished at the sagacity of the perfume extractors of past ages, which enabled them to perceive that some flowers could be treated only by this absorption process, and to co-ordinate their operations so logically that the method could not have been better adapted to its purpose if it had been adjusted after a careful study of the physiological principles involved. Everything in the process seems adapted to the prolongation of the life of the flower. The close and consequently moist atmosphere in which it is placed preserves it against dying; the coolness of the apparatus prevents its wilting. The flowers of the tuberose are picked just as the bud is about to open. It blooms within the case, and gives out nearly all its perfume there.

We draw from these observations the two lessons that the extraction of natural perfumes is not, as is often believed, a question of pure chemistry, but is primarily one of vegetable physiology; and that in this domain, as in many others, practice is often in advance of theory. For my own part, I have never met with well-established processes sanctioned by long use which do not rest upon correct though frequently unconscious observations over which theory has nothing to boast.

As when people wanted to travel faster they devised the railroad instead of improving the stagecoach, so the achievements of chemistry in the domain of perfumes have not been made in building up the old industry, but through creating another. To enumerate and describe the artificial products now used in perfumery would be like composing a manual of chemistry. It will be of more interest to indicate a few categories of syntheses or chemical fabrications, and to point out the various chemical or financial questions they raise, illustrating them severally by typical examples described in detail.

There are several kinds of synthesis. One kind consists in isolating a natural principle, studying it, and trying to reproduce it. Such a synthesis may be called a methodical one, as following out a line traced from the beginning. Take, for example, the synthesis of ionone, or artificial violet. The authors of this synthesis, MM. Tiemann and Krüger, started with the natural perfume of iris root, which they found to be very characteristic and fixed. It was consequently considered to be a single very definite and stable substance. All these conditions were favorable. The preliminary researches of the authors showed that this substance existed in extremely weak proportions in iris powder. The proposed synthesis, therefore, promised to be lucrative; for, while all chemical syntheses are interesting, the probable financial bearing of the discovery is of consider-

able importance; and it is not the absolute cost but the probable profit that most deserves consideration. A primary characteristic of perfumes is their immense strength; a very minute quantity of one is sufficient to produce a large effect. Consequently, they may bear a large price without limiting consumption. But, to isolate this as yet unknown perfume, it was necessary to treat enormous quantities of iris powder, and this required industrial resources which the inventors could not command. These were secured by making suitable arrangements with two large houses which became parties in interest. The experiments lasted ten years. First, *irone*, the principle to which the odor of the violet is due, was isolated. A complete chemical study of it was made. Having remarked that citral, an aldehyde abundantly diffused in Nature, gave, on condensation with acetone, an acetone of the same crude formula as irone, these authors effected this condensation under the influence of hydrate of baryta. They thus obtained, as they had expected, an acetone of the same crude formula as irone—false irone; this, it is true, had neither the odor nor the properties of irone, but by the action of dilute sulphuric acid it was transformed into its cyclic isomer, ionone. From the chemical point of view, ionone not being identical with irone, but only an isomer, the problem could not be said to be solved; but it was fully solved from the industrial point of view. Ionone possesses, like irone, the perfume of the violet, with a slight shade perceptible to practiced noses, but lending itself admirably to all the uses of perfumery. We have in this a complete example of methodical synthesis, although it must be admitted that the authors were aided by happy combinations of circumstances that might not always occur.

There are also chance syntheses. Thus, a substance, the odor of which may be utilized, is sometimes fallen upon in pursuing researches undertaken for another purpose. This is what happened, for example, in the case of Baur's artificial musk. M. Baur had undertaken the study of two carbides of hydrogen—two butyltoluenes contained in the essence of resin. He isolated and separated these substances, and then in experiments connected with the performance of the synthesis he perceived an extremely pronounced odor of musk appertaining to the trinitrile derivative of isobutyltoluene. M. Baur was not led to his researches by chance, but the discovery of his musk, the most precious result of them, was not anticipated by him.

There are other cases in which a series of bodies are prepared with full expectation of what the chemical results will be, but without knowing what odor they will have, or whether they will be odoriferous, but with the expectation that they will be, and

that some may be found among them the odors of which can be utilized.

Syntheses of this kind only rarely lead to natural principles; more frequently what perfumers call chemical products are obtained, or perfumes which betray their origin to a greater or less extent, and can not be used in the preparation of the finest products, but have cheapness and great strength in their favor. We should observe that chemical synthesis takes to the odorous principle itself, while essences contain only a very slight proportion of the active substance.

Finally, it sometimes happens that no new material is discovered, but some laboratory reaction already known is turned to industrial use. Such is the case with heliotropine, formerly known as piperonylic aldehyde or piperonal; terpineol, or white lilac; anisic aldehyde, or hawthorn, etc.

Twenty-five or thirty years ago it was believed that with a few well-known exceptions, such as those of bitter almonds, anise, mustard, and some others, the essences were constituted of hydrocarbons, $C_{10}H_{16}$ in indefinite numbers, all isomeric and similar to spirits of turpentine. Our views on this subject have been considerably modified. It has been found that the hydrocarbons or terpenes contained in essences may be referred to well-defined species possessing characteristic reactions and derivatives, some of them crystallizable, by which they may be distinguished. Oxidized principles have been isolated in essences related to the fatty series, capable of facile transformation into cyclic derivatives, which may be regarded as connecting links between the fatty and the aromatic series. Frequently a natural essence represents a harmonious mixture of various combinations. Oil of bergamot, having a composition of this character, possesses an odor vastly more characteristic than any of its components taken separately. And it sometimes happens that compounds suitable for fine perfumery, if they were pure, are spoiled by the presence of disagreeably smelling substances. The elimination of such principles, or the refining of such perfumes, has given rise to a second branch of our chemical industry.

The discoveries that have so far been made are quite insufficient to explain the composition and odor of essences. We find certain substances, like linalool and geraniol, common constituents in essences of the most different characters, and are hence forced to recognize that in a great number of cases they are only the vehicle, the substratum, of the really characteristic perfume; and we begin to suspect the presence of still rarer principles corresponding probably with a more differentiated, more specialized organism, and related to the specific characteristics of the vegetable cell.—*Translated for the Popular Science Monthly from the Revue Scientifique.*

ARCHÆOLOGY AND THE ANTIQUITY OF MAN.*

By Sir JOHN EVANS, K. C. B., D. C. L., LL. D., Sc. D.

ONCE more has the Dominion of Canada invited the British Association for the Advancement of Science to hold one of the annual meetings of its members within the Canadian territory, and for a second time has the association had the honor and pleasure of accepting the proffered hospitality. In doing so the association has felt that if by any possibility the scientific welfare of a locality is promoted by its being the scene of such a meeting, the claims should be fully recognized of those who, though not dwelling in the British Isles, are still inhabitants of that Greater Britain, whose prosperity is so intimately connected with the fortunes of the mother country. Here, especially, as loyal subjects of one beloved sovereign, the sixtieth year of whose beneficent reign has just been celebrated with equal rejoicing in all parts of her empire, as speaking the same tongue, and as in most instances connected by the ties of one common parentage, we are bound together in all that can promote our common interests. There is, in all probability, nothing that will tend more to advance those interests than the diffusion of science in all parts of the British Empire, and it is toward this end that the aspirations of the British Association are ever directed, even if, in many instances, the aim may not be attained.

We are, as already mentioned, indebted to Canada for previous hospitality, but we must also remember that, since the time when we last assembled on this side of the Atlantic, the Dominion has provided the association with a president, Sir William Dawson, whose name is alike well known in Britain and America, and whose reputation is indeed world-wide. We rejoice that we have still among us the pioneer of American geology, who, among other discoveries, first made us acquainted with the "Air Breathers of the Coal," the terrestrial or, more properly, arboreal saurians of the New Brunswick and Nova Scotia coal measures.

On our last visit to Canada, in 1884, our place of assembly was Montreal, a city which is justly proud of her McGill University; today we meet within the buildings of another of the universities of this vast Dominion, and in a city the absolute fitness of which for such a purpose must have been foreseen by the native Indian tribes when they gave to a small aggregation of huts upon this spot the name of Toronto—"the place of meetings." Our gathering this

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* Presidential address delivered at the annual meeting of the British Association for the Advancement of Science at Toronto, 1897.

year presents a feature of entire novelty and extreme interest, inasmuch as the sister association of the United States of America—still mourning the loss of her illustrious president, Professor Cope—and some other learned societies have made special arrangements to allow of their members coming here to join us. I need hardly say how welcome their presence is, or how gladly we look forward to their taking part in our discussions and aiding us by interchange of thought. To such a meeting the term "international" seems almost misapplied. It may rather be described as a family gathering, in which our relatives more or less distant in blood, but still intimately connected with us by language, literature, and habits of thought, have spontaneously arranged to take part. The domain of science is no doubt one in which the various nations of the civilized world meet upon equal terms, and for which no other passport is required than some evidence of having striven toward the advancement of natural knowledge. Here, on the frontier between the two great English-speaking nations of the world, who is there that does not inwardly feel that anything which conduces to an intimacy between the representatives of two countries, both of them actively engaged in the pursuit of science, may also, through such an intimacy, react on the affairs of daily life and aid in preserving those cordial relations that have now for so many years existed between the great American Republic and the British Islands, with which her early foundations are indissolubly connected? The present year has witnessed an interchange of courtesies which has excited the warmest feelings of approbation on both sides of the Atlantic—I mean the return to its proper custodians of one of the most interesting of the relics of the Pilgrim Fathers, the log of the Mayflower. May this return, trifling in itself, be of happy augury as testifying to the feelings of mutual regard and esteem which animate the hearts both of the donors and of the recipients!

At our meeting in Montreal the president was an investigator who had already attained to a foremost place in the domains of physics and mathematics, Lord Rayleigh. In his address he dealt mainly with topics such as light, heat, sound, and electricity, on which he is one of our principal authorities. His name and that of his fellow-worker, Professor Ramsay, are now and will in all future ages be associated with the discovery of the new element, argon. Of the ingenious methods by which that discovery was made, and the existence of argon established, this is not the place to speak. One can only hope that the element will not always continue to justify its name by its inertness. The claims of such a leader in physical science as Lord Rayleigh to occupy the presidential chair are self-evident, but possibly those of his successor on this side of the Atlantic

are not so immediately apparent. I can not for a moment pretend to place myself on the same purely scientific level as my distinguished friend and for many years colleague, Lord Rayleigh, and my claims, such as they are, seem to me to rest on entirely different grounds. Whatever little I may have indirectly been able to do in assisting to promote the advancement of science, my principal efforts have now for many years been directed toward attempting to forge those links in the history of the world, and especially of humanity, that connect the past with the present, and toward tracing that course of evolution which plays as important a part in the physical and moral development of man as it does in that of the animal and vegetable creation. It appears to me, therefore, that my election to this important post may, in the main, be regarded as a recognition by this association of the value of archæology as a science. Leaving all personal considerations out of question, I gladly hail this recognition, which is, indeed, in full accordance with the attitude already for many years adopted by the association toward anthropology, one of the most important branches of true archæology.

It is no doubt hard to define the exact limits which are to be assigned to archæology as a science and archæology as a branch of history and *belles lettres*. A distinction is frequently drawn between science on the one hand and knowledge or learning on the other; but translate the terms into Latin and the distinction at once disappears. In illustration of this I need only cite Bacon's great work on the Advancement of Learning, which was, with his own aid, translated into Latin under the title *De Augmentis Scientiarum*. It must, however, be acknowledged that a distinction does exist between archæology proper and what, for want of a better word, may be termed antiquarianism. It may be interesting to know the internal arrangements of a Dominican convent in the middle ages; to distinguish between the different moldings characteristic of the principal styles of Gothic architecture; to determine whether an English coin bearing the name of Henry was struck under Henry II, Richard, John, or Henry III; or to decide whether some given edifice was erected in Roman, Saxon, or Norman times. But the power to do this, though involving no small degree of detailed knowledge and some acquaintance with scientific methods, can hardly entitle its possessors to be enrolled among the votaries of science. A familiarity with all the details of Greek and Roman mythology and culture must be regarded as a literary rather than a scientific qualification; and yet when among the records of classical times we come upon traces of manners and customs which have survived for generations, and which seem to throw some rays of light upon the dim

past, when history and writing were unknown, we are, I think, approaching the boundaries of scientific archæology.

Every reader of Virgil knows that the Greeks were not merely orators, but that with a pair of compasses they could describe the movements of the heavens and fix the rising of the stars; but when by modern astronomy we can determine the heliacal rising of some well-known star, with which the worship in some given ancient temple is known to have been connected, and can fix its position on the horizon at some particular spot, say, three thousand years ago, and then find that the axis of the temple is directed exactly toward that spot, we have some trustworthy scientific evidence that the temple in question must have been erected at a date approximately 1100 years B. C. If on or close to the same site we find that more than one temple was erected, each having a different orientation, these variations, following, as they may fairly be presumed to do, the changing position of the rising of the dominant star, will also afford a guide as to the chronological order of the different foundations. The researches of Mr. Penrose seem to show that in certain Greek temples, of which the date of foundation is known from history, the actual orientation corresponds with that theoretically deduced from astronomical data. Sir J. Norman Lockyer has shown that what holds good for Greek temples applies to many of far earlier date in Egypt, though up to the present time hardly a sufficient number of accurate observations have been made to justify us in foreseeing all the instructive results that may be expected to arise from astronomy coming to the aid of archæology. The intimate connection of archæology with other sciences is in no case so evident as with respect to geology, for when considering subjects such as those I shall presently discuss it is almost impossible to say where the one science ends and the other begins.

By the application of geological methods many archæological questions relating even to subjects on the borders of the historical period have been satisfactorily solved. A careful examination of the limits of the area over which its smaller coins are found has led to the position of many an ancient Greek city being accurately ascertained; while in England it has only been by treating the coins of the ancient Britons, belonging to a period before the Roman occupation, as if they were actual fossils that the territories under the dominion of the various kings and princes who struck them have been approximately determined. In arranging the chronological sequence of these coins, the evolution of their types—a process almost as remarkable, and certainly as well defined, as any to be found in Nature—has served as an efficient guide. I may venture to add that the results obtained from the study of the

morphology of this series of coins were published ten years before the appearance of Darwin's great work on the Origin of Species. When we come to the consideration of the relics of the early iron and bronze ages the aid of chemistry has of necessity to be invoked. By its means we are able to determine whether the iron of a tool or weapon is of meteoritic or volcanic origin, or has been reduced from iron ore, in which case considerable knowledge of metallurgy would be involved on the part of those who made it. With bronze antiquities the nature and extent of the alloys combined with the copper may throw light not only on their chronological position but on the sources whence the copper, tin, and other metals of which they consist were originally derived. I am not aware of there being sufficient differences in the analyses of the native copper from different localities in the region in which we are assembled for Canadian archæologists to fix the sources from which the metal was obtained which was used in the manufacture of the ancient tools and weapons of copper that are occasionally discovered in this part of the globe. Like chemistry, mineralogy and petrology may be called to the assistance of archæology in determining the nature and source of the rocks of which ancient stone implements are made; and, thanks to researches of the followers of those sciences, the old view that all such implements formed of jade and found in Europe must of necessity have been fashioned from material imported from Asia can no longer be maintained. In one respect the archæologist differs in opinion from the mineralogist—namely, as to the propriety of chipping off fragments from perfect and highly finished specimens for the purpose of submitting them to microscopic examination.

I have hitherto been speaking of the aid that other sciences can afford to archæology when dealing with questions that come almost, if not quite, within the fringe of history, and belong to times when the surface of our earth presented much the same configuration as regards the distribution of land and water and hill and valley as it does at present, and when in all probability the climate was much the same as it now is. When, however, we come to discuss that remote age in which we find the earliest traces that are at present known of man's appearance upon earth the age of geology and paleontology becomes absolutely imperative. The changes in the surface configuration and in the extent of the land, especially in a country like Britain, as well as the modifications of the fauna and flora since those days, have been such that the archæologist pure and simple is incompetent to deal with them, and he must either himself undertake the study of these other sciences or call experts in them to his assistance. The evidence that man had already appeared upon the earth is afforded by stone implements wrought by

his hands, and it falls strictly within the province of the archæologist to judge whether given specimens were so wrought or not; it rests with the geologist to determine their stratigraphical or chronological position, while the paleontologist can pronounce upon the age and character of the associated fauna and flora. If left to himself the archæologist seems too prone to build up theories founded upon form alone, irrespective of geological conditions. The geologist, unaccustomed to archæological details, may readily fail to see the difference between the results of the operations of Nature and those of art, and may be liable to trace the effects of man's handiwork in the chipping, bruising, and wearing which in all ages result from natural forces; but the united labors of the two, checked by those of the paleontologist, can not do otherwise than lead toward sound conclusions.

It will perhaps be expected of me that I should on the present occasion bring under review the state of our present knowledge with regard to the antiquity of man; and probably no fitter place could be found for the discussion of such a topic than the adopted home of my venerated friend, the late Sir Daniel Wilson, who first introduced the word "prehistoric" into the English language. Some among us may be able to call to mind the excitement not only among men of science but among the general public when, in 1859, the discoveries of M. Boucher de Perthes and Dr. Rigollot in the gravels of the valley of the Somme, at Abbeville and Amiens, were confirmed by the investigations of the late Sir Joseph Prestwich, myself, and others, and the co-existence of man with the extinct animals of the Quaternary fauna, such as the mammoth and woolly-haired rhinoceros, was first virtually established. It was at the same time pointed out that these relics belonged to a far earlier date than the ordinary stone weapons found upon the surface, which usually showed signs of grinding or polishing, and that, in fact, there were two stone ages in Britain. To these the terms "neolithic" and "palæolithic" were subsequently applied by Sir John Lubbock. The excitement was not less when, at the meeting of this association at Aberdeen in the autumn of that year, Sir Charles Lyell, in the presence of the Prince Consort, called attention to the discoveries in the valley of the Somme, the site of which he had himself visited, and to the vast lapse of time indicated by the position of the implements in drift deposits a hundred feet above the existing river. The conclusions forced upon those who examined the facts on the spot did not receive immediate acceptance by all who were interested in geology and archæology, and fierce were the controversies on the subject that were carried on both in the newspapers and before various learned societies. It is at the same time instructive and amus-

ing to look back on the discussions of those days. While one class of objectors accounted for the configuration of the flint implements from the gravels by some unknown chemical agency, by the violent and continued gyratory action of water, by fracture resulting from pressure, by rapid cooling when hot, or by rapid heating when cold, or even regarded them as aberrant forms of fossil fishes, there were others who, when compelled to acknowledge that the implements were the work of men's hands, attempted to impugn and set aside the evidence as to the circumstances under which they had been discovered. In doing this they adopted the view that the worked flints had either been introduced into the containing beds at a comparatively recent date, or if they actually formed constituent parts of the gravel then that this was a mere modern alluvium resulting from floods at no very remote period. In the course of a few years the main stream of scientific thought left this controversy behind, though a tendency to cut down the lapse of time necessary for all the changes that have taken place in the configuration of the surface of the earth and in the character of its occupants since the time of the palæolithic gravels still survives in the inmost recesses of the hearts of not a few observers.

In his address to this association at the Bath meeting of 1864 Sir Charles Lyell struck so true a note that I am tempted to reproduce the paragraph to which I refer: "When speculations on the long series of events which occurred in the Glacial and Post-glacial periods are indulged in, the imagination is apt to take alarm at the immensity of the time required to interpret the monuments of these ages, all referable to the era of existing species. In order to abridge the number of centuries which would otherwise be indispensable, a disposition is shown by many to magnify the rate of change in prehistoric times by investing the causes which have modified the animate and inanimate world with extraordinay and excessive energy. It is related of a great Irish orator of our day that when he was about to contribute somewhat parsimoniously toward a public charity he was persuaded by a friend to make a more liberal donation. In doing so he apologized for his first apparent want of generosity by saying that his early life had been a constant struggle with scanty means, and that 'they who are born to affluence can not easily imagine how long a time it takes to get the chill of poverty out of one's bones.' In like manner we of the living generation, when called upon to make grants of thousands of centuries in order to explain the events of what is called the modern period, shrink naturally at first from making what seems so lavish an expenditure of past time. Throughout our early education we have been accustomed to such strict economy in all that relates to the chronol-

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ogy of the earth and its inhabitants in remote ages, so fettered have we been by old traditional beliefs, that even when our reason is convinced and we are persuaded that we ought to make more liberal grants of time to the geologist, we feel how hard it is to get the chill of poverty out of our bones." Many, however, have at the present day got over this feeling, and of late years the general tendency of those engaged upon the question of the antiquity of the human race has been in the direction of seeking for evidence by which the existence of man upon the earth could be carried back to a date earlier than that of the Quaternary gravels. There is little doubt that such evidence will eventually be forthcoming, but, judging from all probability, it is not in northern Europe that the cradle of the human race will eventually be discovered, but in some part of the world more favored by a tropical climate, where abundant means of subsistence could be procured, and where the necessity for warm clothing did not exist. Before entering into speculations on this subject, or attempting to lay down the limits within which we may safely accept recent discoveries as firmly established, it will be well to glance at some of the cases in which implements are stated to have been found under circumstances which raise a presumption of the existing of man in Pre-glacial, Pliocene, or even Miocene times.

Flint implements of ordinary palæolithic type have, for instance, been recorded as found in the eastern counties of England in beds beneath the chalky bowlder clay; but on careful examination the geological evidence has not to my mind proved satisfactory, nor has it, I believe, been generally accepted. Moreover, the archæological difficulty that man, at two such remote epochs as the Pre-glacial and the Post-glacial, even if the term "glacial" be limited to the chalky bowlder clay, should have manufactured implements so identical in character that they can not be distinguished apart, seems to have been entirely ignored. Within the last few months we have had the report of worked flints having been discovered in the late Pliocene forest bed of Norfolk, but in that instance the signs of human workmanship upon the flints are by no means apparent to all observers. But such an antiquity as that of the forest bed is as nothing when compared with that which would be implied by the discoveries of the work of men's hands in the Pliocene and Miocene beds of England, France, Italy, and Portugal, which have been accepted by some geologists. There is one feature in these cases which has hardly received due attention, and that is the isolated character of the reputed discoveries. Had man, for instance, been present in Britain during the crag period, it would be strange indeed if the sole traces of his existence that he left were a perforated tooth of a

large shark, the sawn rib of a manatee, and a beaming full face carved on the shell of a pectunculus!

In an address to the Anthropological Section at the Leeds meeting of this association in 1890 I dealt somewhat fully with these supposed discoveries of the remains of human art in beds of Tertiary date; and I need not here go further into the question. Suffice it to say that I see no reason why the verdict of "not proven," at which I then arrived, should be reversed. In the case of a more recent discovery in upper Burma in beds at first pronounced to be upper Miocene, but subsequently "definitely ascertained to be Pliocene," some of the flints are of purely natural and not artificial origin, so that two questions arise: First, were the fossil remains associated with the worked flints or with those of natural forms? and second, were they actually found in the bed to which they have been assigned, or did they merely lie together on the surface? Even the *Pithecanthropus erectus* of Dr. Eugène Dubois from Java meets with some incredulous objectors from both the physiological and the geological sides. From the point of view of the latter the difficulty lies in determining the exact age of what are apparently alluvial beds in the bottom of a river valley.

When we return to palæolithic man it is satisfactory to feel that we are treading on comparatively secure ground, and that the discoveries of the last forty years in Britain alone enable us to a great extent to reconstitute his history. We may not know the exact geological period when first he settled in the British area, but we have good evidence that he occupied it at a time when the configuration of the surface was entirely different from what it is at present, when the river valleys had not been cut down to anything like their existing depth, when the fauna of the country was of a totally different character from that of the present day, when the extension of the southern part of the island seaward was in places such that the land was continuous with that of the continent, and when in all probability a far more rainy climate prevailed. We have proofs of the occupation of the country by man during the long lapse of time that was necessary for the excavation of the river valleys. We have found the old floors on which his habitations were fixed, we have been able to trace him at work on the manufacture of flint instruments, and by building up the one upon the other the flakes struck off by the primeval workman in those remote times we have been able to reconstruct the blocks of flint which served as his material. That the duration of the palæolithic period must have extended over an almost incredible length of time is sufficiently proved by the fact that valleys, some miles in width and of a depth of from one hundred to one hundred and fifty feet, have been eroded since

the deposit of the earliest implement-bearing beds. Nor is the apparent duration of this period diminished by the consideration that the floods which hollowed out the valleys were not in all probability of such frequent occurrence as to teach palæolithic man by experience the danger of settling too near to the streams, for had he kept to the higher slopes of the valley there would have been but little chance of his implements having so constantly formed constituent parts of the gravels deposited by the floods.

The examination of British cave deposits affords corroborative evidence of this extended duration of the palæolithic period. In Kent's Cavern at Torquay, for instance, we find in the lowest deposit, the breccia below the red cave earth, implements of flint and chert corresponding in all respects with those of the high level and most ancient river gravels. In the cave earth these are scarcer, though implements occur which also have their analogues in the river deposits; but, what is more remarkable, harpoons of reindeer's horn and needles of bone are present, identical in form and character with those of the caverns of the reindeer period in the south of France, and suggestive of some bond of union or identity of descent between the early troglodytes, whose habitations were geographically so widely separated the one from the other.

In a cavern at Creswell Crags, on the confines of Derbyshire and Nottinghamshire, a bone has, moreover, been found engraved with a representation of parts of a horse in precisely the same style as the engraved bones of the French caves. It is uncertain whether any of the river-drift specimens belong to so late a date as these artistic cavern remains; but the greatly superior antiquity of even these to any neolithic relics is testified by the thick layer of stalagmite which had been deposited in Kent's Cavern before its occupation by men of the neolithic and bronze periods. Toward the close of the period covered by the human occupation of the French caves there seems to have been a dwindling in the number of the larger animals constituting the Quaternary fauna, whereas their remains are present in abundance in the lower and therefore more recent of the valley gravels. This circumstance may afford an argument in favor of regarding the period represented by the later French caves as a continuation of that during which the old river gravels were deposited, and yet the great change in the fauna that has taken place since the latest of the cave deposits included in the palæolithic period is indicative of an immense lapse of time. How much greater must have been the time required for the more conspicuous change between the old Quaternary fauna of the river gravels and that characteristic of the neolithic period! As has been pointed out by Prof. Boyd Dawkins, only thirty-one out of the forty-eight well-

ascertained species living in the Post-glacial or river-drift period survived into prehistoric or neolithic times. We have not, indeed, any means at command for estimating the number of centuries which such an important change indicates; but when we remember that the date of the commencement of the neolithic or surface stone period is still shrouded in the mist of a dim antiquity, and that prior to that commencement the river-drift period had long come to an end; and when we further take into account the almost inconceivable ages that even under the most favorable conditions the excavation of wide and deep valleys by river action implies, the remoteness of the date at which the palæolithic period had its beginning almost transcends our powers of imagination. We find distinct traces of river action from one hundred to two hundred feet above the level of existing streams and rivers, and sometimes at a great distance from them; we observe old fresh-water deposits on the slopes of the valleys several miles in width; we find that long and lofty escarpments of rock have receded unknown distances since their summits were first occupied by palæolithic man; we see that the whole side of a wide river valley has been carried away by an invasion of the sea, which attacked and removed a barrier of chalk cliffs from four hundred to six hundred feet in height; we find that what was formerly an inland river has been widened out into an arm of the sea, now the highway of our fleets, and that gravels which were originally deposited in the bed of some ancient river now cap isolated and lofty hills.

And yet, remote as the date of the first known occupation of Britain by man may be, it belongs to what, geologically speaking, must be regarded as a quite recent period, for we are now in a position to fix with some degree of accuracy its place on the geological scale. Thanks to investigations ably carried out at Hoxne, in Suffolk, and at Hitchin, in Hertfordshire, by Mr. Clement Reid, under the auspices of this association and of the Royal Society, we know that the implement-bearing beds at those places undoubtedly belong to a time subsequent to the deposit of the great chalky bowlder clay of the eastern counties of England. It is, of course, self-evident that this vast deposit, in whatever manner it may have been formed, could not for centuries after its deposition was complete have presented a surface inhabitable by man. Moreover, at a distance but little farther north beds exist which also, though at a somewhat later date, were apparently formed under glacial conditions. At Hoxne the interval between the deposit of the bowlder clay and of the implement-bearing beds is distinctly proved to have witnessed at least two noteworthy changes in climate. The beds immediately reposing on the clay are characterized by the presence

of alder in abundance, of hazel and yew, as well as by that of numerous flowering plants indicative of a temperate climate very different from that under which the bowlder clay itself was formed. Above these beds, characterized by temperate plants, comes a thick and more recent series of strata, in which leaves of the dwarf arctic willow and birch abound, and which were in all probability deposited under conditions like those of the cold regions of Siberia and North America. At a higher level and of more recent date than these—from which they are entirely distinct—are the beds containing palæolithic implements, formed in all probability under conditions not essentially different from those of the present day. However this may be, we have now conclusive evidence that the palæolithic implements are, in the eastern counties of England, of a date long posterior to that of the great chalky bowlder clay.

It may be said, and said truly, that the implements at Hoxne can not be shown to belong to the beginning rather than to some later stage of the palæolithic period. The changes, however, that have taken place at Hoxne in the surface configuration of the country prove that the beds containing the implements can not belong to the close of that period. It must, moreover, be remembered that in what are probably the earliest of the palæolithic deposits of the eastern counties, those at the highest level, near Brandon in Norfolk, where the gravels contain the largest proportion of pebbles derived from glacial beds, some of the implements themselves have been manufactured from materials not native to the spot, but brought from a distance, and derived in all probability either from the bowlder clay or from some of the beds associated with it. We must, however, take a wider view of the whole question, for it must not for a moment be supposed that there are the slightest grounds for believing that the civilization, such as it was, of the palæolithic period originated in the British Isles. We find in other countries implements so identical in form and character with British specimens that they might have been manufactured by the same hands. These occur over large areas in France under similar conditions to those that prevail in England. The same forms have been discovered in the ancient river gravels of Italy, Spain, and Portugal. Some few have been recorded from the north of Africa, and analogous types occur in considerable numbers in the south of that continent. On the banks of the Nile, many hundreds of feet above its present level, implements of the European types have been discovered; while in Somaliland, in an ancient river valley at a great elevation above the sea, Mr. Seton-Karr has collected a large number of implements formed of flint and quartzite, which, judging from their form and character, might have been dug out of the drift deposits of the

Somme of the Seine, the Thames or the ancient Solent. In the valley of the Euphrates implements of the same kind have also been found, and again farther east in the lateritic deposits of southern India they have been obtained in considerable numbers. It is not a little remarkable, and is at the same time highly suggestive, that a form of implement almost peculiar to Madras reappears among implements from the very ancient gravels of the Manzanares at Madrid. In the case of the African discoveries we have as yet no definite paleontological evidence by which to fix their antiquity, but in the Narbadá Valley of western India palæolithic implements of quartzite seem to be associated with a local fauna of Pleistocene age, comprising, like that of Europe, the elephant, hippopotamus, ox, and other mammals of species now extinct. A correlation of the two faunas with a view of ascertaining their chronological relations is beset with many difficulties, but there seems reason for accepting this Indian Pleistocene fauna as in some degree more ancient than the European.

Is this not a case in which the imagination may be fairly invoked in aid of science? May we not from these data attempt in some degree to build up and reconstruct the early history of the human family? There, in eastern Asia, in a tropical climate, with the means of subsistence readily at hand, may we not picture to ourselves our earliest ancestors gradually developing from a lowly origin, acquiring a taste for hunting, if not indeed being driven to protect themselves from the beasts around them, and evolving the more complicated forms of tools or weapons from the simpler flakes which had previously served them as knives? May we not imagine that when once the stage of civilization denoted by these palæolithic implements had been reached the game for the hunter became scarcer, and that his life in consequence assumed a more nomad character? Then, and possibly not till then, may a series of migrations to "fresh woods and pastures new" not unnaturally have ensued, and these following the usual course of "westward toward the setting sun" might eventually lead to a palæolithic population finding its way to the extreme borders of western Europe, where we find such numerous traces of its presence. How long a term of years may be involved in such a migration it is impossible to say, but that such a migration took place the phenomena seem to justify us in believing. It can hardly be supposed that the process that I have shadowed forth was reversed, and that man, having originated in northwestern Europe, in a cold climate where clothing was necessary and food scarce, subsequently migrated eastward to India and southward to the Cape of Good Hope. As yet our records of discoveries in India and eastern Asia are but scanty; but it is there that

the traces of the cradle of the human race are, in my opinion, to be sought, and possibly future discoveries may place upon a more solid foundation the visionary structure that I have ventured to erect.

It may be thought that my hypothesis does not do justice to what Sir Thomas Browne has so happily termed "that great antiquity, America." I am, however, not here immediately concerned with the important neolithic remains of all kinds with which this great continent abounds. I am now confining myself to the question of palæolithic man and his origin, and in considering it I am not unmindful of the Trenton implements, though I must content myself by saying that the "turtle-back" form is essentially different from the majority of those on the wide dissemination of which I have been speculating, and, moreover, as many here present are aware, the circumstances of the finding of these American implements are still under careful discussion. Leaving them out of the question for the present, it may be thought worth while to carry our speculations rather further, and to consider the relations in time between the palæolithic and the neolithic periods. We have seen that the stage in human civilization denoted by the use of the ordinary forms of palæolithic implements must have extended over a vast period of time if we have to allow for the migration of the primeval hunters from their original home, wherever it may have been in Asia or Africa, to the west of Europe, including Britain. We have seen that during this migration the forms of the weapons and tools made from siliceous stones had become, as it were, stereotyped, and, further, that during the subsequent extended period implied by the erosion of the valleys the modifications in the form of the implements and the changes in the fauna associated with the men who used them were but slight. At the close of the period during which the valleys were being eroded comes that represented by the latest occupation of the caves by palæolithic man, when both in Britain and in the south of France the reindeer was abundant; but among the stone weapons and implements of that long troglodytic phase of man's history not a single example with the edge sharpened by grinding has as yet been found. All that can safely be said is that the larger implements, as well as the larger mammals, had become scarcer, that greater power in chipping flint had been attained, that the arts of the engraver and the sculptor had considerably developed, and that the use of the bow had probably been discovered. Directly we encounter the relics of the neolithic period, often, in the case of the caves lately mentioned, separated from the earlier remains by a thick layer of underlying stalagmite, we find flint hatchets polished at the edge and on the surface, cutting at the broad and not at the

narrow end, and other forms of implements associated with a fauna in all essential respects identical with that of the present day.

Were the makers of these polished weapons the direct descendants of palæolithic ancestors whose occupation of the country was continuous from the days of the old river gravels? or had these long since died out, so that after western Europe had for ages remained uninhabited it was repeopled in neolithic times by the immigration of some new race of men? Was there, in fact, a "great gulf fixed" between the two occupations? or was there in Europe a gradual transition from the one stage of culture to the other? It has been said that "what song the sirens sang, or what name Achilles assumed when he hid himself among women, though puzzling questions, are not beyond all conjecture"; and though the questions now proposed may come under the same category, and must await the discovery of many more essential facts before they receive definite and satisfactory answers, we may, I think, throw some light upon them if we venture to take a few steps upon the seductive if insecure paths of conjecture. So far as I know we have as yet no trustworthy evidence of any transition from the one age to the other, and the gulf between them remains practically unbridged. We can, indeed, hardly name the part of the world in which to seek for the cradle of neolithic civilization, though we know that traces of what appear to have been a stone-using people have been discovered in Egypt, and that what must be among the latest of the relics of their industry have been assigned to a date some thirty-five hundred to four thousand years before our era. The men of that time had attained to the highest degree of skill in working flint that has ever been reached. Their beautifully made knives and spearheads seem indicative of a culminating point reached after long ages of experience; but whence these artists in flint came or who they were is at present absolutely unknown, and their handiworks afford no clew to help us in tracing their origin. Taking a wider survey, we may say that, generally speaking, not only the fauna but the surface configuration of the country were, in western Europe at all events, much the same at the commencement of the neolithic period as they are at the present day. We have, too, no geological indications to aid us in forming any chronological scale.

The occupation of some of the caves in the south of France seems to have been carried on after the erosion of the neighboring river valleys had ceased, and so far as our knowledge goes these caves offer evidence of being the latest in time of those occupied by man during the palæolithic period. It seems barely possible that though in the north of Europe there are no distinct signs of such late occupation, yet that in the south man may have lived on, though

in diminished numbers; and that in some of the caves, such, for instance, as those in the neighborhood of Mentone, there may be traces of his existence during the transitional period that connects the palæolithic and neolithic ages. If this were really the case, we might expect to find some traces of a dissemination of neolithic culture from a north Italian center, but I much doubt whether any such traces actually exist. If it had been in that part of the world that the transition took place, how are we to account for the abundance of polished stone hatchets found in central India? Did neolithic man return eastward by the same route as that by which in remote ages his palæolithic predecessor had migrated westward? Would it not be in defiance of all probability to answer such a question in the affirmative? We have, it must be confessed, nothing of a substantial character to guide us in these speculations; but, pending the advent of evidence to the contrary, we may, I think, provisionally adopt the view that owing to failure of food, climatal changes, or other causes, the occupation of western Europe by palæolithic man absolutely ceased, and that it was not until after an interval of long duration that Europe was repeopled by a race of men immigrating from some other part of the globe where the human race had survived, and in course of ages had developed a higher stage of culture than that of palæolithic man.

I have been carried away by the liberty allowed for conjecture into the regions of pure imagination, and must now return to the realms of fact, and one fact on which I desire for a short time to insist is that of the existence at the present day, in close juxtaposition with our own civilization, of races of men who—at all events but a few generations ago—lived under much the same conditions as did our own neolithic predecessors in Europe. The manners and customs of these primitive tribes and peoples are changing day by day, their languages are becoming obsolete, their myths and traditions are dying out, their ancient processes of manufacture are falling into oblivion, and their numbers are rapidly diminishing, so that it seems inevitable that ere long many of these interesting populations will become absolutely extinct. The admirable Bureau of Ethnology instituted by our neighbors in the United States of America has done much toward preserving a knowledge of the various native races in this vast continent; and here in Canada the annual Archæological Reports presented to the Minister of Education are rendering good service in the same cause. Moreover, the committee of this association appointed to investigate the physical characters, languages, and industrial and social conditions of the northwestern tribes of the Dominion of Canada is about to present its twelfth and final report, which, in conjunction with those already presented,

will do much toward preserving a knowledge of the habits and languages of those tribes. It is sad to think that Mr. Horatio Hale, whose comprehensive grasp of the bearings of ethnological questions, and whose unremitting labors have so materially conduced to the success of the committee, should be no longer among us. Although this report is said to be final, it is to be hoped that the committee may be able to indicate lines upon which future work in the direction of ethnological and archæological research may be profitably carried on in this part of her Majesty's dominions. It is, however, lamentable to notice how little is being or has been officially done toward preserving a full record of the habits, beliefs, arts, myths, languages, and physical characteristics of the countless other tribes and nations more or less uncivilized which are comprised within the limits of the British Empire. At the meeting of this association held last year at Liverpool it was resolved by the general committee "that it is of urgent importance to impress upon the Government the necessity of establishing a Bureau of Ethnology for Greater Britain, which, by collecting information with regard to the native races within and on the borders of the empire, will prove of immense value to science and to the Government itself." It has been suggested that such a bureau might with the greatest advantage and with the least outlay and permanent expense be connected either with the British Museum or with the Imperial Institute, and the project has already been submitted for the consideration of the trustees of the former establishment. The existence of an almost unrivaled ethnological collection in the museum, and the presence there of officers already well versed in ethnological research, seem to afford an argument in favor of the proposed bureau being connected with it. On the other hand, the Imperial Institute was founded with an especial view to its being a center around which every interest connected with the dependencies of the empire might gather for information and support. The establishment within the last twelve months of a scientific department within the institute, with well-appointed laboratories and a highly trained staff, shows how ready are those concerned in its management to undertake any duties that may conduce to the welfare of the outlying parts of the British Empire—a fact of which I believe that Canada is fully aware. The institute is therefore likely to develop, so far as its scientific department is concerned, into a bureau of advice in all matters scientific and technical, and certainly a Bureau of Ethnology such as that suggested would not be out of place within its walls. Wherever such an institution is to be established, the question of its existence must of necessity rest with her Majesty's Government and Treasury, inasmuch as without funds, however moderate, the

undertaking can not be carried on. I trust that in considering the question it will always be borne in mind that in the relations between civilized and uncivilized nations and races it is of the first importance that the prejudices, and especially the religious or semi-religious and caste prejudices of the latter should be thoroughly well known to the former. If but a single "little war" could be avoided in consequence of the knowledge acquired and stored up by the Bureau of Ethnology preventing such a misunderstanding as might culminate in warfare, the cost of such an institution would quickly be saved.

I fear that it will be thought that I have dwelt too long on primeval man and his modern representatives, and that I should have taken this opportunity to discuss some more general subject, such as the advances made in the various departments of science since last this association met in Canada. Such a subject would no doubt have afforded an infinity of interesting topics on which to dilate. Spectrum analysis, the origin and nature of celestial bodies, photography, the connection between heat, light, and electricity, the practical applications of the latter, terrestrial magnetism, the liquefaction and solidification of gases, the behavior of elements and compounds under the influence of extreme cold, the nature and uses of the Röntgen rays, the advances in bacteriology and in prophylactic medicine, might all have been passed under review, and to many of my audience would have seemed to possess greater claims to attention than the subject that I have chosen. It must, however, be borne in mind that most, if not indeed all, of these topics will be discussed by more competent authorities in the various sections of the association by means of the presidential addresses or otherwise. Nor must it be forgotten that I occupy this position as a representative of archæology, and am therefore justified in bringing before you a subject in which every member of every race of mankind ought to be interested—the antiquity of the human family and the scenes of its infancy.

Others will direct our thoughts in other directions, but the further we proceed the more clearly shall we realize the connection and interdependence of all departments of science. Year after year, as meetings of this association take place, we may also foresee that "many shall run to and fro and knowledge shall be increased." Year after year advances will be made in science and in reading that Book of Nature that lies ever open before our eyes; successive stones will be brought for building up that temple of knowledge of which our fathers and we have labored to lay the foundations. May we not well exclaim with old Robert Recorde: "Oh woorthy temple of Goddes magnificence: Oh throne of glorye and seate of

the lorde: thy substance most pure what tonge can describe? thy signes are so wonderous, surmountinge mannes witte, the effects of thy motions so diuers in kinde: so harde for to searche, and worse for to fynde—Thy woorkes are all wonderous, thy cunning unknowen: yet seedes of all knowledge in that booke are sowen—And yet in that boke who rightly can reade, to all secrete knowledge it will him straighte leade." *

AN EXPERIMENT IN CITIZEN TRAINING.

By WINIFRED BUCK.

SO far as the present writer knows, Mr. Jacob A. Riis was the first person to say that it was a boy's energy and love of organization—not his badness—that made him join a street gang; Mr. Riis also added that energy and love of organization are just the characteristics to make the best members of a "boys' club."

Mr. Riis and Mrs. Van Rensselaer (the President of the Public Education Association) have succeeded through their energy and perseverance in gaining permission of the Board of Education to open in the evenings certain rooms in one of the Tenth Ward schoolhouses. In these rooms, as soon as possible, clubs are to be opened for both boys and girls. To describe the restrictions and regulations concerning the organizing of these clubs would be out of place here, but it is hoped that in a few years every schoolhouse in New York will open certain rooms for the purpose, as the demand among boys and girls for such organizations is very great.

The first club which will be opened (called "club" in distinction from many organizations which are really more in the nature of "classes," having definite instruction as a regular part of their programme) is to be "Junior Good Government Club No. 2." This kind of club has no connection whatever with the more famous organizations of nearly the same name, but the title so well describes its chief purpose that it was thought best to adopt it. Junior Good Government Club No. 1 has been in existence for about four years in the University Settlement in Delancey Street. As it is the only one we know of which consciously follows certain principles, a description of it may be of interest to those who perhaps think of starting some such club themselves, or who might care to know what the first schoolhouse club is to be.

The club in question is composed of thirty-five boys, whose ages range from twelve to fifteen years. A greater number than thirty-

* Preface to Robert Recorde's Castle of Knowledge, 1556.

five could scarcely have full justice done them either during the first hour, when a large room and a small gymnasium are all they have to play a wonderful variety of games in, or during the last hour, when the allotted time would be insufficient for each boy to have his part in the discussion of the many subjects that come before the club for consideration.

Each of the two hours of the club's session has its special significance. During the first the boys and the large room with its many opportunities (and limitations also) represent the conditions of a primitive society, for the only law which seems necessary to make every one happy is a simple one, and is applied in this hour in its simplest way. This law is "perfect freedom for all, bounded only by the freedom of others." No one thing could teach the principles of this great law better than games, for not only must it be obeyed within each game, but it must be constantly observed in the relations of one to another, when, in a very limited space, many different kinds are being played at the same time.

Visitors have often seen some of the boys in "No. 1" playing modified baseball in the main part of the room, and others practicing trapeze and dumb-bell exercises in the gymnasium, while in odd corners and other available spots of both rooms boxing and wrestling matches were taking place at the same time that the more quiet boys were playing at tables the games that better suited their natures. All the boys realize so well that each one of them must make some concession for the good of all and for the safety of property, that these games are played with the utmost good nature, apparently great pleasure, and safety not only for the members but for the pictures and gas shades which decorate the walls.

During this first hour a great deal of noise is allowed; but it is only in harmony with the law of freedom that, should it become annoying, it must cease. During the usual amusements of this first hour, however, no one can fail to notice how noise adds to the spirit of gayety, and how it increases physical activity. Indeed, has a silent game of tag or baseball ever been heard of?

In this hour the director interferes as little as possible, although she is obliged, three or four times, to suggest some adaptation by which a greater number of boys can enjoy themselves. She can not remember a time, however, in which it has been necessary for her to more than *suggest* the change. Such a thing as dismissing any of the boys, or threatening to dismiss them if they will not accept the suggestion, is unheard of. In the experience of this writer all normal children prefer right to wrong. If one believes this, one must see at once that it is only fair to give them the chance *voluntarily* to do right first. The question, "Is this just, is this

fair?" (if it is in relation to a situation simple enough for a child to see all the bearings of) will be enough to make him choose instantly the right course. That is just what the first hour of freedom aims at giving—opportunities for seeing one another in clear and simple relations. It affords an excellent preparation, too, for the second hour when, to carry out the original idea, it might be said that a higher state of civilization is attained, and consequently it becomes necessary to build upon the simple fundamental law an apparently complicated system if justice and freedom are to be assured each member. It is soon found that the club (or society, to carry out the larger view of club life) should consist of members who not only are ready to comply with a general law, but who as individuals also possess certain characteristics. The wish to discuss these characteristics makes the first *raison d'être* of the business meeting. A few of the simpler rules of parliamentary law (which, by the way, typifies in itself almost perfectly the law of freedom and justice in complicated relations) are learned from Cushing's Manual. Officers are elected, and then the momentous question arises for discussion, "Do we want as members of our club boys who gamble, steal, smoke, or swear?" We can not wonder much that these are popular sports on the East Side. An overcrowded tenement house is not an inspiring or healthy place to play in. Baseball is forbidden, and running games are almost impossible in the streets. Roller skating and bicycling can not be said to have many devotees for obvious reasons. Thus boys of naturally fine characters are driven to stealing and gambling as the only fields in which to exercise their imaginations, and in which to find excitement and diversion. Of the reasons for these "sports" being wrong, a surprising number have never thought. However, in speaking in public before one's peers, it is possible from the moment the first word is uttered to feel ideas springing into life which one was never conscious of having had before, and to hear one's self arguing eloquently for some cause in which one had little interest two minutes before. The first attempt at self-expression calls together the hitherto scattered fragments of thoughts and impressions, and forms them into deep-rooted convictions. This happens all the time in the business meeting, when the necessity for making their own laws sets all the boys to thinking, and most of them to talking also. It is a bad boy indeed who will do very often what he has convinced *himself* is wrong.

After days of excited talk nearly every one in the club is ready to admit that it is wrong to steal and gamble, foolish to smoke, and vulgar to swear, and ready to make a law to the effect that these practices are forbidden to the members. The question of punishment for possible backsliders naturally comes next. The first ideas

on this subject are very crude. Punishment—very severe and the same for every folly and crime—satisfies them for a while, but the time surely comes when some one suggests the possibility of mitigating circumstances, and finally, after hours of discussion, punishment is graded. Then some one has the thought that, after all, punishment is not the word to be used, or, indeed, the idea to be carried out in a club, and that the various penalties paid for breaking laws (suspension or expulsion usually) should merely be regarded as a means of self-defense by the club, and as the natural consequence of crime by the offender. Little by little, from a crude and brutal or sentimentally weak set of laws, grows a constitution not only written in the correct form, but containing much truth and justice. But in starting a new club it is better for the director not to give the club a perfect constitution, for it is only the years of discussion and experience out of which that perfect constitution is evolved, that helps the boys. All the good that comes from club life must come slowly and gradually—so gradually that all the minutest details of the machine of government are known and understood by the boys, and acknowledged by them, one by one, to be necessary. Figuratively speaking, and perhaps stretching the idea a little to make the meaning clear, they have *broadly* in the two hours of the club's session, and in *detail* in the three years of club life and growth, lived through all the stages of man's development, from his simplest attempts at law-making thousands of years ago to the complex machinery by which we are governed to-day. By understanding the necessity for every law as it is made, the boys become willing law-keepers; they become intelligent ones also, for they see that constant watchfulness and thoughtfulness are necessary to keep those laws up to the ever-growing and changing requirements of humanity.

Although the ultimate authority is, of course, vested in the director, in the Junior Good Government Clubs the boys are encouraged to stand on their own feet, so to speak, and to make decisions on all questions themselves, as it is believed that in this way their characters will be strengthened and their reasoning powers developed. The director of "No. 1" goes so far as to tell her boys that she does not claim infallibility; that if they see any untruth in what she tells them, or any flaw in her logic, it will not signify disrespect or impertinence to argue against her, just as they would if they disagreed with an ordinary member. Indeed, more than once has the director humbly given in to the superior judgment of one of the boys. However, it is sometimes more convenient if the boys have not the habit of making points of order against her.

The importance of letting the boys see the *natural* consequences of wrong-doing is inestimable, and it is because of this that the de-

bates on the innumerable subjects in connection with club government are far more useful in moral development than debates on outside subjects—political or literary. After a decision in a debate on club affairs, the boys will see "how it works" in a week or two; they will also know the exact circumstances that led to the necessity for a decision.

It is also because of the value of seeing the natural consequences that it is better for a club of this kind to be governed by the laws which all have taken part in making, rather than by the director, who is apt to get mixed as to what are natural consequences and what are her own nerves.

It is a curious fact that the untrained boy, like the untrained man, when given the chance of self-government, falls at once into the way of devising the most ingenious and complicated bad government possible. Junior Good Government Club No. 1, and all the other clubs this writer knows, have lived through their Tammany Hall periods. When a year comes in which the majority of members have had two or three years' training in the club, charges of bribery and corruption are few, but when the older members move out, and their places are filled from below by more youthful "politicians," then the Tammany-Platt situation is inevitable sooner or later.

It is often asked if clubs of this kind are distinctly reformatory. The writer of this article once visited a criminal lunatic asylum, and after making a tour of the wards and having noticed the striking malformation of the heads and bodies of the patients, she asked one of the doctors if he knew how many of them owed their condition to lack of nourishment before and after birth. "Roughly speaking, fifty per cent," he answered. If lack of nourishment can cause criminal insanity, it can cause simple criminal tendencies, and unfortunately insufficient and improper nourishment is the common condition among even those people whom we are wont to consider not "desperately poor." To answer the question asked at the beginning of this paragraph, it is very doubtful if abnormal criminal children would be greatly benefited by Junior Good Government Clubs. Reformatory these clubs certainly are for those who have become criminal through environment only; but reform is not the chief object to be attained. Growth in character and reasoning power comes to a child after a few years in such a club, and many latent gifts are developed in his nature through the freedom to use all of himself. Such clubs are just as important for the children of rich and intelligent parents as for those of the poor and ignorant. Whether the former, with their many opportunities for enjoyment, would find clubs amusing is another question.

Although we said that the reform of criminals was not the chief objects of these clubs, nevertheless it is accomplished very frequently, and, what is even better, a higher and higher sense of honor and morality is developed in each boy every year of his club life. In most cases to have the intelligence to know what is right is to do right, and with growing perception, awakened by continually thinking, questioning, and reasoning, the most harmless act of one year appears to the boys a downright wrong-doing the next.

The success of the clubs in the public schools will depend very much on the help given by well-educated and sympathetic people of either sex. If three or four Junior Good Government Clubs could be established in the course of time in every school in New York, there would be less work for our political reformers to do twenty years hence. From the experience of several years it is safe to prophesy that boys who learn to run honestly and successfully their Junior Good Government Clubs are never going to try, in after years, to run *dishonestly* (but too successfully, in one sense) their city.

SKETCH OF CARL VOGT.

CARL CHRISTOPH VOGT, the eldest of a family of nine children, was born in Giessen, Hesse, July 5, 1817, the son of Dr. Wilhelm Vogt, professor of clinics in the university of that place, and Louise Follenius. Professor Vogt, the father, lived honored and beloved by the people of Giessen, but frowned upon in official circles on account of his independent democratic spirit. Of the family of Madame Vogt, the father was a judge highly esteemed for his probity and erudition, but mistrusted by the Government, while her three brothers went far to confirm that mistrust by being, besides jurists, soldiers, and poets, republicans who in time had to be expelled from the country. One of these brothers, Karl Theodor Christian Follenius, implicated in the assassination of Kotzebue, became known in this country as Prof. Charles Follen, of Harvard University, author of German text-books, poet, Unitarian minister, and one of the victims of the burning of the steamer Lexington on Long Island Sound in 1840.

Carl Vogt's boyhood exhibited no special features, but was much like that of other boys. He was fond of going with his younger brother Emil on pedestrian tours. Being rather fat, he was a little awkward in gymnastics, but attained great skill in sword combats, in which he usually came off victor.

The days of listless study and fencing came to an end, and Vogt

entered the laboratory of Liebig as a medical student. The system pursued there was a novel one in those days. The pupil was given a task to perform, and was left to himself to work out his own way and solve the problem as best he might. The next morning the students were called upon to describe what they had done and what they had discovered. A company of bright young men, who afterward became famous in science, was then collected around Liebig's tables, and Vogt formed strong friendships with some of them. During this period of study with Liebig the elder Vogt accepted a professorship in Bern, Switzerland, and removed thither.

Carl Vogt had completed his first memoir, on the Water of the Amnios at Different Periods of Fœtal Life (published in 1837), and was still thinking of no other career than that of chemistry, when he gave shelter to a law student who had been implicated in a plot against the Government, and kept him in his room till the search for him became dangerous. The student was sent away in one direction and Vogt sought refuge with his uncle Bose, forester to the Grand Duke at Jugenheim. The Grand Duke himself was enjoying a holiday on the estate with a prince of Prussia. Vogt borrowed a forester's uniform and engaged in the chase along with their Highnesses' huntsmen, while the police were searching for him everywhere except within the private domain of the sovereign. The princes returned to their courts, and Vogt, skillfully eluding the guards of the Rhine, escaped to Strasburg and thence to Bern.

Vogt interested himself in Strasburg in visiting the hospitals, where he found many political refugees, and in studying at the libraries and museums zoölogy and fossil forms till his father called him to Bern to assist him. With his natural taste for surgery went a sensitive nature which could not bear to witness the pain attendant upon operations in those days before anæsthetic and other humane appliances were introduced. He took up other branches and became a pupil of Prof. G. Valentin, author of the present physiological theory of the nerves and organs of the senses. He received his degree with honor at twenty-one years of age, and locked his diploma in a trunk which was deposited in the garret. He was proud, however, when his two completed memoirs on the Nerves of Reptiles won the praises of Karl Ernst von Bauer and of Humboldt. They were based upon a collection of American reptiles which Humboldt had left at Valentin's institute.

Louis Agassiz, a frequent visitor at Wilhelm Vogt's, wanted Carl in 1838 to assist him at Neufchâtel, but was introduced to Edouard Desor, then seeking employment, and took him. Carl followed a few months afterward. Agassiz, interested in the study of fresh-water fishes and living and fossil echinoderms, had fitted up

a lodge on the shore of the lake, where Desor and Vogt were installed to carry on the investigations. Vogt composed here the anatomical part of Desor's work on Fossil Fishes, the Fishes of the Old Red Sandstone, and the German edition of Studies of Glaciers.

The controversy concerning glacial action was at its height. A theory had been proposed of an immense glacier having once occupied the Rhône Valley above Martigny, but Agassiz was still doubtful about it. He, with Desor, had visited the principal glacial fields of the Alps, and conceived a plan for studying a glacier continuously. In 1839 a party of about a dozen students, of whom Agassiz, Desor, Vogt, and Pourtales are best known to Americans, with guides and porters, established themselves by the lower glacier of the Aar, where they could watch its inner life. A suitable camping place was found by the side of an immense bowlder, and a lodge was instituted and given the name of the Hôtel des Neuchatelois. The hôtel was much visited during the four years the students occupied it by guests, many of whom became illustrious in science. Vogt's first book, *Im Gebirg und auf den Gletschern*, embodying his experiences there, was published in 1842.

The new glacial theory was still bitterly opposed, and by no one with more vigor than Leopold von Buch. It fell to Vogt to defend it before the German scientific meeting at Erlangen in 1840, and then at Mayence, both times in von Buch's presence. His expositions were interrupted by frequent objections from von Buch, who replied with all his force. Vogt, paying no attention to invectives and sarcasms of his antagonist, simply exposed the insufficiency of his arguments, and concluded with a protest against the road to free inquiry being barred by the mischievous principle of authority in science. He won the day. Shortly after this Vogt and Agassiz differed on a question concerning the award of credit for discoveries and publications and separated.

Vogt spent three years in Paris, working busily and producing many zoölogical and biological memoirs; published his Text-book of Geology and Petrifactions, and figured prominently in the formation of the Society of German Physicians, which has become a very important body. In the text-book he expressed doubts concerning the theory of a fluid nucleus within the earth, which everybody held then. Vogt's fame reached the general public through his *Physiologische Briefe*, a book which brought the science within the comprehension of the ordinary reader, while it was still welcome to the professional man. It treated the subject of generation with a plainness that had not been ventured upon in any other popular work; and it attacked the doctrine of the survival of the soul, affirming, in effect, that all the properties designated as mental activity

are simply functions of the cerebral substance. It was condemned by the ecclesiastics and was the subject of controversies in the German universities. On one of his journeys his attention was drawn, by witnessing the operation of the fishermen, to the Bay of Villafranca as a suitable station for zoölogical research. He fixed a laboratory there and set down to work. In a short time he was invited by Liebig to return to Giessen as professor of geology. The officials at Darmstadt, recollecting his revolutionary proclivities, opposed and delayed his confirmation, bringing all manner of objections against him, and among them that he had opposed von Buch and ridiculed his theories. Von Buch, however, attested to his fitness for the position; Humboldt recommended him, and he was appointed in December, 1846, and took his position in April, 1847. He delivered and published his inaugural address, On the Present Condition of the Descriptive Sciences; translated Desor's Geological Excursions; published his Ocean and Mediterranean; and had just completed the arrangement of his Zoölogical Laboratory when the revolutions of 1848 broke out. He was chosen to represent Giessen at the Congress of Deputies, or *Vor Parlament*, which met at Frankfort, March 31st, and again at the German Parliament of May 18th. He wrote vigorous articles for the liberal journals; and when the Parliament was driven to Stuttgart in May, 1849, he was named one of the five regents of the empire, to whom discretionary powers were given. When Stuttgart was placed under siege he retired to Bern, where, as a member of the Committee of Assistance, he succored political refugees of all countries. When the throng of refugees had thinned out, Professor Vogt made another sojourn at Villafranca and published studies of the siphonophores and tunicates or salpæ, issued two or three political satires under scientific disguises, translated the Vestiges of Creation, and published the *Zoologische Briefe*, a book which became a necessity to students.

In March, 1852, M. A. Tourte, Superintendent of Public Instruction in Geneva, offered Professor Vogt the chair of botany in the academy there. The offer was declined, botany not being a specialty of Vogt's, and he was offered geology and paleontology with embryology. He made himself felt in the life and fortunes of the city, and rendered valuable service to Geneva and Switzerland. He was consulted as a geological expert in the building of the railroads of the country; was interested in the first conception of the St. Gothard Tunnel, which was pierced years afterward under the direction of another Genevan; he assisted in the foundation of the National Institute of Science, Letters, Fine Arts, and Agriculture, and was its president for a quarter of a century; he sat at different times, twenty-one years in all, in the Grand Council of the Canton

of Geneva, the Council of Swiss States, and the National Council; and he exerted a strong personal influence in political affairs.

Professor Vogt labored earnestly to promote the establishment of marine zoölogical laboratories, as well as of smaller stations, and sought to enlist the co-operation in the scheme of friends in high places in different countries. His efforts in behalf of this cause continued through forty years, his first letter on the subject having been written in 1855, and his last in 1894.

The theory suggested in Darwin's Origin of Species fell in well with Professor Vogt's views, as they may be found expressed in citations from his writings as far back as the Embryology of the Salmons, in 1842. Yet, as M. Quatrefages has shown in his *Emules de Darwin*, he did not agree with that author in all points. Divergences between the two are shown in Vogt's study of the *Archæopteryx* and in articles published in French and German reviews and issued afterward in separate form.

In May, 1861, Professor Vogt went, on the invitation of Dr. Berna, of Frankfort, upon a voyage to the northern seas in the brig Joachim Heinrich. Besides these two, Gressley, the erratic geologist, Hasselhorst, the painter, and Alexander Herzen, the younger, were of the party. Having visited the North Cape, they proceeded to Jan Mayen, an island whose ice-bound coasts had baffled many a sailor and explorers of high rank, and which was still nearly unknown. They effected a landing and examined the whole rock. They then went to Iceland, where the capital was decorated in their honor, and started for home on the 15th of September. Professor Vogt's book descriptive of this voyage was published in October, 1862.

The special characteristic of the *Vorlesungen über den Menschen* —Lectures on Man—1862–'63, which was translated into several languages, was its presentation for the first time in the concrete, and compactly, of the fundamental data of anthropology and its insistence upon the anatomical relations of man with the lower animals. It played a prominent part in the controversies of the next ten years over materialism. A less serious work was the translation of Brillat Savarin's Physiology of Taste, in recognition of which the translator was made honorary president of the Society of Cooks of Munich. The discoveries of the flint implements, the relics of man in caves, and the lake dwellings were the subject of several memoirs by Professor Vogt, and he projected a complete work upon them, but was never able to prepare it. His last paper on the subject was one respecting the bones of the *Pithecanthropus erectus*, which was published in a Frankfort journal two months previous to his death.

In 1864–'66 Professor Vogt published a collection of lectures on injurious and useful animals, embodying one of the earliest pleas for the birds, and for which he received a silver medal and a testimonial letter from the Paris Society for the Protection of Animals; and a memoir on those curiously deformed human beings (of which the "Aztec children" of the showmen were specimens) called "microcephales" or man-monkeys. He regarded the defects in structure of these creatures as phenomena of atavism, or reversion to the structure of simian ancestors—man in body, monkey in mind. The publication was the occasion of bitter controversies.

This added to his fame, and when, in 1867, he started on a lecture tour in Germany, Austria, and Belgium, he met large audiences. The purpose of his lectures was to make a popular presentation of the Darwinian principles and to vindicate freedom of inquiry. The theory of the man-monkey was formally and earnestly discussed, at the Prehistoric Congress held at Copenhagen in 1869, between Professors Vogt and Quatrefages. Vogt, with Virchow, Fraas, Ecker, and others, at this time took the first steps toward the formation of the German Anthropological Society; and the first volume of the *Archiv für Anthropologie* contained an article by Vogt on the Primitive Times of the Human Race.

During the Franco-German War of 1870 Vogt's sympathies were with France, and he opposed the German annexation of Alsace-Lorraine. This caused a temporary estrangement between him and his German friends. The unpleasant feeling gradually passed away, and when, in 1871, the Congress of Prehistoric Archæology and Anthropology met at Bologna in connection with the celebration of the eight hundredth anniversary of the university, he was relied upon to temper the hostility between the French and German professors, who had carried their political animosities into their science.

One of the most curious incidents of Professor Vogt's life, considering what a freethinker he was, was his defense of the Roman Catholic schools in Geneva against a bill depriving them of privileges which were still left to the Protestants and Jews. The bishop asked his influence in the matter, saying in his letter that notwithstanding their differences on all common questions, he recognized Vogt as the impartial champion of the liberties of all. This act caused a separation of Vogt from the majority of his party on the question and aroused some animosity, culminating in an unsuccessful effort to disturb his position in the academy. Shortly afterward a faculty of medicine was created, and the academy was raised to the rank of a university. Professor Vogt was active in the efforts that were used toward making the institution worthy of its name and providing it with a suitable building. His lectures to his classes are described

as having been carefully prepared, with every detail of substance and illustration faithfully looked after, and as excelling in the quality of making arduous questions understandable to all. He translated into French Gegenbaur's Manual of Comparative Anatomy, published his Atlas of Zoölogy, and, studying life at the seaside in his vacations, wrote those charming articles, making his name familiar to readers of all classes, which appeared from time to time in various German popular periodicals. He was commissioned by the Genevan Government to investigate the phylloxera and report upon it. He defended vivisection and charged its opponents with committing the cruelties they denounced. Did they not patronize the stock raisers who mutilated their animals to make them fatter and more pleasant to the taste; and feast on fish which had been tortured in catching; and ride behind mutilated horses?

Professor Vogt's memoir on the Archæopteryx is one of the most important documents in the discussion which defined that fossil as marking a notable stage in the transition from the avian to the reptilian form. When, in 1880, Dr. Hahn speculated on the presence of organic growths in meteorites, Professor Vogt exposed the fallacies of his conclusions; and in a second memoir he and Dennis Monier, professor of chemistry, showed with proofs from their own experiments that all the essential features of Hahn's meteoric fossils could be artificially produced with inorganic substances. He protested against the extension and predominance of militarism; contended against overloading youth with school duties; advocated a rational system of school hygiene; and opposed the study of Greek and Latin.

Vogt's Mammals, published at Munich near the beginning of 1884, with numerous plates and illustrations, was written in a pleasant style, and made most prominent the habits and the geographical distribution of animals.

The Treatise on Practical Comparative Anatomy was published after eight years of preparation, with the names of Carl Vogt and Emil Yung as joint authors, and acknowledgments to Dr. Jacquet.

As infirmity began to grow upon him, Professor Vogt tried the injections of Brown-Séquard's elixir, from which he enjoyed a temporary invigoration, and described the experiment in the *Frankfürter Zeitung*.

The last work he contemplated was a Treatise on the Fishes of Central Europe, which, with the assistance of M. Grote, of Barmen, was to be magnificently illustrated. He did not live to finish it.

On May 4, 1895, after Professor Vogt had suffered long from insomnia, his doctor gave him an injection of morphine. He at once fell asleep, but never woke, and at five o'clock the next afternoon his heart ceased to beat.

Editor's Table.

ARE THE AMERICAN PEOPLE CIVILIZED?

TO most persons such a question will seem very absurd. Of course, the American people are civilized. They are probably the most civilized on the face of the earth, not in a material sense merely but in an immaterial sense. Where is there more anxious discussion of ways and means to elevate the condition of the poor both morally and physically, and to alleviate the sufferings of the unfortunate? Where is there so much money given to promote the work of charity and education? But the sympathies of the American people are not confined to their own borders. When there is a great calamity abroad, like an Irish or Russian famine, or an Indian plague, no purse is opened more quickly or widely than theirs; and as to work in the missionary field, have they not contributed countless sums to carry it on?

But these statements betray an inexact knowledge of the essence of civilization. They show how the mind is taken with the ostentatious and dazzling, which may possess a meaning quite different from that attached to them, and how it fails to grasp the more significant but hardly less obvious phenomena of American social and political life. Charity does not necessarily mean a high civilization, for it may be born of vanity, a conspicuous trait of the barbarian, and be so shortsighted as to be utterly destructive of the best interests of the race. Nor does education in the popular sense—that is, the acquisition of facts and the sharpening of the intellect—mean civilization proper, for, as Mr. Morley pointed out in his recent lecture on Machiavelli, rare scholarship and a high degree of æsthetic taste, such as those of the Medici and their associates, may be coupled with unspeakable baseness. The truly civilized man does not refrain simply from conduct that is clearly wrong, such as robbery and murder, but he refrains from conduct that tends in indirect and obscure ways to injure his fellows, depriving them in the long run of their lives and their property. His sympathies are lively in the highest degree. But they are rational. While they respond to immediate suffering, they respond more quickly to the greater remote suffering that unwise philanthropy always inflicts. While, finally, he is resentful of invasions of his own rights, he is invariably considerate and jealous of the rights of others.

When judged by this standard, one that a few persons in every community have already reached, the American people can hardly be said to have attained civilization. In fact, they are, in many respects, still on the level of barbarians, deficient in self-control, oblivious to the rights and feelings of others, incapable of grasping the less obvious but more important results of a given line of conduct, and even given over to actual lawlessness and crime. They may shudder at Armenian massacres, and feel that the Turk deserves the solicitude of the hangman. They may denounce with a Carlylean wealth of epithet the Spanish cruelties in Cuba, which are, in reality, nothing more than the inevitable accompaniment of war, and clamor for an intervention that will put an end to them in the interest of humanity.

But have they earned the right to set themselves up as international philanthropists, when their own hearthstone, according to Dr. Andrew D. White, is made red every year with the blood of more than ten thousand victims of the homicide? Do their generous contributions to domestic charities and foreign missions entitle them to distinction as model representatives of Christian civilization, when mobs of leading citizens in New York and Ohio, as well as in various Southern States, lynch negroes charged with crimes that have not been proved? Has not Christian civilization some conquests to make in a land where, as in New Orleans, Italians are murdered with the approval of public sentiment, and, as in many parts of the West, the treatment of Chinese is hardly less savage than that of European missionaries in the most benighted districts of the Celestial Empire? Is it not clear also that barbarism has yet to be abolished where striking workingmen burn down property and assail the men ready to take their places with a ferocity that the followers of Attila might have envied?

But it is not such obvious facts as these that justify the sneering smile of the cynic at the patriotic boast of Americans in regard to their civilization. Certain conspicuous features of our public policy are not less indicative of the tastes and instincts of a barbarian. Take, for one example, the provision of the Constitution of the State of New York that restricts prison labor. Had the convention that framed it proposed that, in order to relieve the Commonwealth of its criminal burden, a certain number of prisoners should be strangled every month, what an outburst of horror throughout the country there would have been! But the provision actually adopted by the picked representatives of the people and afterward approved by the people themselves is hardly less atrocious. The idleness it enforces is driving prisoners mad. Yet there is more effort to stop cruelty to animals and to throttle science by putting an end to vivisection than there is to suppress this form of atrocity. Take, for another example, the law recently passed that will either enhance the price or vitiate the quality of every commodity on which a protective duty is levied. A people really civilized could no more have permitted it to be placed on the statute books than they could permit thieves to rob the poor of a part of their food and clothing, making it more difficult for them to live and thus increasing the suffering that philanthropists and social reformers are seeking in endless ways to alleviate. It would have seemed to them nothing less than barbarous to pass a law that not only makes it more difficult for their own countrymen to live, but deprives people in foreign countries, like the Welsh tinplate makers and the Austrian pearl-button makers, of a means of livelihood. Take, for still another example, the imperfect international copyright law. People that appreciate in but a very indistinct manner the existence of property in ideas and refuse to protect it effectively do not meet the requirements of the definition of civilization.

But the policy of aggression, which is the more fit term that Mr. Spencer applies to what is called protection, a policy inherited directly from feudal barbarism, is not confined to tariff laws and imperfect international copyright laws; it extends to the innumerable laws passed by State and national Legislatures in restriction of personal liberty and in authorization of the seizure of private property for purposes outside of the legitimate sphere of government.

Money taken from a man for an object that he does not approve, such as circulating libraries, public baths, and a hundred and one other schemes supposed to be for the benefit of people, is as much a violation of the principle of equal rights, the unfailing test of a high civilization, as the highwayman's possession of a traveler's purse. The same is true of taxes in support of so-called public charities, which are not charities at all, properly speaking. They are simply compulsory largesses, since they are not voluntary contributions prompted by the altruism of the citizen, but forced contributions that he is always glad to escape.

So enormously has this policy of aggression grown within the past few years; so indifferent have people become to the fundamental duty of human society, namely, the maintenance of order and the enforcement of justice; little wonder that "a spirited foreign policy" is now one of the most cherished ideals of the American people. It is only an extension of the domestic aggression to the field of foreign politics. People that violate incessantly and without the slightest compunction the rights of one another, no matter what fine motives they may give themselves in justification, are certain to be deficient in respect for the rights of the foreigner. Not in a negative way alone by the passage of tariff and anti-immigration acts will they attack him. But they will attack him positively, issuing blustering declarations of defiance and insult, proposing the violation of the laws of nations in order to interfere in behalf of rebellious subjects, conniving at conspiracies to overthrow a monarchical government in the interest of a more democratic one, and making elaborate preparations on land and sea to engage in any conflict that may be provoked.

The induction to be made from an examination of these phenomena of American social and political life is obvious. It is that we shall never reach the highest civilization by the path that we are pursuing so energetically and with so much self-satisfaction. A continuance of the policy of aggression, both domestic and foreign, can not fail to end disastrously. Devotion to the work of perfecting our criminal laws and the suppression of crime; to the simplification of our civil laws, making justice cheap and easy; and to the redemption of our various governments from the pilferers that have taken possession of them, may not appeal very powerfully to the imagination of men intent on great and showy schemes of state philanthropy. But it will do infinitely more to promote American civilization. It will teach men to respect the rights of others, and to do nothing that will violate even remotely the principle of justice. It will lead them to depend upon themselves—that is, voluntary co-operation, instead of the state—that is, compulsory co-operation—to promote the schemes of the philanthropist for the alleviation of human suffering and the advancement of the human race.

ABSTRACTIONS IN EDUCATION.

A RECENT article by Mr. Frederick Burk in the Atlantic Monthly gives a vivid idea of the uselessness and worse than uselessness of much of the instruction that is imparted to normal-school classes under the head of Psychology and Methods of Education. Mr. Burk has been attending classes in several of the foremost institutions for the training of teachers, and furnishes verbatim reports of what he heard. As we think it of importance that attention should be called as widely as possible to his

observations and conclusions, we shall here quote portions of his article.

In one normal school the question under discussion in the psychology class was as to the nature and authority of conscience, and the question having been asked, Is conscience an infallible guide? the following answer was accepted as correct: "In one sense conscience is infallible and in another it is not. Conscience is not infallible in judging what is the highest good; it is infallible in affirming that we should choose in accordance with our sense of obligation." According to this definition, we have, over and above a "sense of obligation" in moral matters, something which tells us we should obey that sense. But if a "sense of obligation" does not of itself imply a need for obedience, what force is there in the words? And what could be more palpably redundant in expression than to say that conscience is that which makes us feel that *we must do what we feel we must do*? Yet such and no other is the sense of the answer accepted as correct.

There was more to come, however. The fallibility of conscience in indicating the right course to follow having been admitted, and the consequent diversity of human standards of conduct having been recognized, the teacher asked whether there was any such thing as an absolute standard. The class answered "Yes," and being asked to say where such a standard was to be found, answered with great unanimity, "In the Word of God." Teacher: "The Word of God, then, makes a revelation of God's will and gives us a standard of absolute right?" Class: "Yes, sir." It might have been expected that at this point the question would have been raised as to how it was that human standards differed so greatly if there was one generally accepted standard in the Word of God; but obvious as this development of the subject was, the discussion broke off at this point save for an objection raised by one of the pupils to the effect that, if the Bible contained the one true standard of right conduct, nations that did not possess it could not know what they ought to do. This objection the teacher disposed of by authoritatively stating that *we* were in no uncertainty, and that the other matter might rest.

Now, if the object of this discussion was in any degree to teach the teachers of the future to *think*, we can only say that they were not fairly dealt with. Every one knows that disputes in regard to questions of duty constantly arise and sometimes wax very sharp between parties who equally recognize the authority of the Bible. If there is one absolute standard in the Bible, why should there be so many conflicting human standards, and why should the conscience of those who accept the Bible frequently lead them astray as seemed to be fully admitted in the class? When our slavery troubles were at their height, was not the Bible invoked with equal conviction on both sides? Did not difference of opinion as to what the Bible taught on the subject lead even to the disruption of churches? To-day legal prohibition of the liquor traffic is a leading issue; and the situation is just the same as it was forty years ago in regard to slavery. Some find prohibition in the Bible; others find a distinct recognition of the lawfulness of wine drinking. So with the question of women's rights, the question of capital punishment, and a dozen others that might be named. For every text which the advocates of one theory can quote, their opponents are ready with one of seemingly opposite import. These are facts

sufficiently notorious to be well within the knowledge of normal students, and therefore to tell such students without qualification that the Bible contained the one absolute standard of right was simply casting dust in their eyes. It is of prime importance that the teachers of the future should be taught to be honest in their intellectual methods, but here was a direct lesson—so at least we regard it—in dishonesty. The moral is, when a discussion threatens to develop in a "dangerous" direction, cut it short or shunt it on to another track. We should not teach that to normal students; we should not teach it to anybody. We may properly teach caution in dealing with difficult subjects, and may point out the errors to which logical processes are always liable; but we should never inculcate the duty of closing the eyes to unwelcome facts. The cause of the Bible is not served by those who put forward conventional views in regard to it and seek to exempt these from criticism. Like all else that is good, the Bible only gains in influence and just authority through being represented simply as it is.

In the same school, the subject of the will being under discussion, the teacher inquired how the will was cultivated. The answer given—correct, we are informed, according to the book—was as follows: "The will is cultivated by cultivating the intellect, which enables the mind to judge more wisely what is the highest good; by listening to the voice of conscience in regulating the natural impulses; by resolving to do always what ought to be done." It seems wonderful that the futility of such talk is not self-evident. If the object was to teach the students how to use words without meaning anything by them we should think this particular exercise well chosen. We are to cultivate the will "by listening to the voice of conscience in regulating the impulses," and "by resolving to do always what ought to be done." But people who can "listen to the voice of conscience" so as to control their impulses, and who are capable of "resolving to do always what ought to be done," have their will already cultivated: we do not see what more they want. Then surely the teacher who approved of the statement that by cultivating the intellect we enable the mind to judge more wisely what is the highest good must have forgotten that only a short time before he had taught the class that the Word of God contained the one perfect standard of right action. What is the use of cultivating our intellects in order to find out what is fully set forth for our guidance in a book accessible to all? A standard once given is something to use, not to dispute about.

We must, however, quote verbatim Mr. Burk's experience in another school.

> One recitation that I heard was upon the formation of judgments.
>
> "What is a judgment?" asked the teacher, as he picked off a card from a pack containing the names of the members of the class.
>
> "A judgment," replied the pupil upon whom the lot fell, "is a relation between concepts."
>
> "What is the act of judging?" was asked as a fresh card was turned.
>
> "The act of judging," said the pupil, "is the act of knowing that the concept of the species is included in the concept of the genus."
>
> "Give an example."
>
> "In the judgment 'a dog is an animal,' the act of judging is the act of knowing that the concept 'dog' is included in the concept 'animal.'"
>
> "In what two ways may concepts be compared?"
>
> "Concepts may be compared in two ways—as to content and as to extent."
>
> "What is a judgment of content?"
>
> "A judgment of content is the knowing that the content of one judgment is included in the content of another."

The wording of this answer was not considered quite correct by the attentive class, and a correction was made.

"What two kinds of judgment of extent are there?" asked the teacher.

"The two kinds of judgment of extent are common judgments of extent and scientific judgments of extent."

"What is a common judgment of extent?" and the turning of the card brought to her feet a ruddy-faced young woman, who said with considerable rapidity, "A common judgment of extent is the knowing that one judgment of extent is included in the concept of another, without genii or species."

A titter admonished her, and she hastily corrected her statement: "I mean, without genii or speciei."

The answer finally accepted as correct was that "a common judgment of extent is the knowing that one judgment of extent is included in the judgment of another without being included as a species of the genus."

Is it not lamentable to think that, in these days, when science is giving so real a character to human knowledge, such unprofitable verbiage as the above should still be foisted upon the minds of students in our most reputable educational institutions? As Mr. Burk very well points out, the sciences of biology and anthropology have revealed the mind as something subject to definite though very complex laws of growth, and have completely overturned the mediæval conception of it as a thing organized and partitioned off according to the methods of thought of adult and fully self-conscious human beings. All questions therefore relating to conscience, will, and judgment should, in relation to education at least, be considered as questions of phase in a developing organism, not as questions of hard fact in a fully and finally developed system. It is satisfactory to learn that in one or two institutions Mr. Burk found the modern point of view fairly well recognized. We hope his article will hasten a much-needed change in pedagogic methods.

POLITICAL BOSSISM.

In former days people used to grow restive periodically under the abuses of monarchical or autocratic government; and there were those who fondly believed that, if monarchy as an institution could be done away with and the people left free to govern themselves, all political troubles would cease. Well, in certain countries, and notably in this, every vestige of monarchy in the hereditary sense has been abolished; the people are free to govern themselves; and yet, judging by the discussions that we read in the daily press, the golden age seems still to delay its coming. The complaint used to be that the monarch was forgetful of the true interests of his subjects, that too much was sacrificed to court intrigues and private favoritism; and, strange to say, we hear to-day complaints which run on precisely the same lines, though directed against quite another class of authorities. Instead of the intrigues of a court we have the intrigues of committees and their managers; and just as before, but perhaps to an even greater extent, the people find that their real interests are being neglected while their supposed servants, but actual rulers, are assigning places and carving out the public wealth with a view mainly to their own convenience and the perpetuation of their power. At the present moment there is in this very community a specially bitter outcry against the evils of political bossism, and thousands of worthy citizens have taken counsel together in the hope of casting asunder the bands which they find so oppressive. If they can by a prodigious effort break the power of the ruling boss, things,

they hope, will go better ever afterward. We are not sure that there is not some illusion in this. No monarch ever placed himself on his throne by his own unaided action; and no boss ever acquired his position by the sole exertion of his own will. The origin of the boss, as we take it, is this: Government with all its powers being thrown into the hands of the people, there arises a keen struggle as to who shall wield those powers and enjoy such advantages as may be incident thereto. Such a struggle necessarily develops into a faction fight; and where there is fighting there must be organization for fighting purposes. The boss is the leader of the faction, the man who surveys with a comprehensive eye the whole field of battle, who enforces discipline, who gives the word of command, who directs the campaign. The old saying that in the midst of arms laws must keep silent is verified in these political struggles. The place which ought to be filled by some competent man prepared to serve the public to the utmost of his ability has to be given to some one whose appointment will "strengthen the party"; and the party is understood to be strengthened when an important office is bestowed in such a manner as (1) to encourage party workers, and (2) to furnish funds for party uses. Neither in actual warfare nor in politics are battles won by discourses on moral philosophy. The boss engages to carry his party to victory, or to nurse its energies after defeat; and he must be allowed a large discretion as to the means to be used.

A little reflection, therefore, will make it clear that the only way to get rid of the boss is to do away with the necessity for his services. As long as he is wanted he will be there, and there is very little use in finding fault with him or with his methods. As well find fault with a general in the field for shelling a town in which the enemy have fortified themselves, or setting fire to standing grain, or doing any other of the thousand wasteful acts that characterize ordinary warfare. War is war the world over, and—bloodshed apart, which, however, may not be far in the background—political warfare has all the signs and characteristics of war in its murderous form. It is a matter of strategy. It involves waste of property, and gains its ends, whenever necessary, by ruse and deceit. The question how to get rid of the boss is merged, therefore, in the much wider one, how to get rid of the conflict that calls the boss into existence and invests him with dictatorial power.

There is but one way that we can see, and that is to persuade the electorate that appointments to office are not things to squabble about, and that, in so far as any man governs through his vote, he is bound to do it in the interest of the country at large. We are not enthusiastic enough to believe that such a change in public sentiment can be brought about in a short time. Still, we consider it important that the seat of the trouble should be distinctly recognized. So long as men are bent on fighting for the control of patronage it is vain to ask them to set aside the leaders upon whose talents for organization, strength of will, and general resourcefulness all their hopes of victory depend. The efforts of reformers should be bent, not on showing how many deplorable acts the different bosses are responsible for, and how little in general they consult the public interest in the exercise of their power, but in bringing home the responsibility for this whole condition of things upon the thousands of electors who never ascend to any correct view of their

political obligations, and consequently never think of using their individual portions of political power for other than selfish ends. The boss will continue to flourish until the people get a new heart. When that day comes he will pass into innocuous desuetude.

Scientific Literature.

SPECIAL BOOKS.

THE climatic treatment of disease has assumed an increasing importance during the last decade, and seems destined to become an even more essential factor than the actual exhibition of drugs. Many of our common ills, especially when they occur in large cities, are primarily due to vicious and unhygienic modes of living, so that oftentimes the simple change to other surroundings will effect a cure. Besides all this, however, and the direct stimulus which lies in the change itself, there is now recognized a distinct curative effect in certain sections and climatic conditions for specific diseases. The book before us* is an attempt to study and systematize this subject of medical climatology so that the practitioner may have some scientific groundwork on which to base his advice to the patient. As Dr. Solly says, this sort of advice is constantly asked for, and the ordinary physician, being quite ignorant of anything like systematic knowledge of the subject, often gives directions based on hearsay or medical-journal notes which are, to say the least, not beneficial in results. The book is divided into three general sections. The first of these deals broadly with the principles of medical climatology, and shows the close connection of this science with physics, meteorology, ethnology, and geographical pathology; the second section treats of the therapeutics of climate in relation to disease; and the third section is devoted to a description of special climates as typified in selected resorts, and includes a number of comparative temperature and rainfall tables. This section is by far the largest, occupying about two thirds of the whole book, and about two thirds of this is given to the United States. There is also a brief survey of climatic conditions in Mexico and South America.

The first two sections are obviously chiefly of interest to the practicing physician, although they are so clearly and simply written as to make easy reading for the layman; but the third section, which describes the various climates and the places where they may be found, including a general survey of the comforts obtainable in the way of living accommodations, food, and the recreative possibilities, is of direct interest to the large number of chronic invalids who are looking for a palliation or correction of their symptoms through climatic agencies.

One of the points dwelt on at length is the fact that a by no means just idea of the suitability of a given district can be obtained by a simple study of its rainfall and temperature charts—the question of humidity being of perhaps more importance than either of these factors, not only largely determining its sensible heat and cold but also its insect and plant life.

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* A Handbook of Medical Climatology. By S. Edwin Solly, M. D. Illustrated. Philadelphia: Lea Brothers and Company. Pp. 470. Price, $4.

The importance of this subject, and more especially the importance of a knowledge of it by the physician, can not be too much insisted on; and Dr. Solly's attempt to bring the hitherto isolated data into some sort of usable order is worthy of the greatest encouragement. In so large a task, it is not surprising if we find some imperfections in its carrying out. One of these is a general diffuseness—a devotion of considerable space to the statement of facts which every schoolboy might be expected to know, and the defining of such things as weather, clouds, and fogs. These, however, are minor imperfections, and the work seems, as a whole, to be worthy of extreme commendation, although, owing to its attempt to cover the climates and health resorts of the entire world, its treatment of individual places is rather meager. The book contains a number of instructive rainfall and relief maps.

In the form of a story in which the animals talk to one another, President *Jordan* has given a sketch of the life history of the fur seal.* The incidents of the story afford a description of the infancy of the pups, the life of the "bachelors," and the family cares of the "beach masters," or full-grown males, and the females. The various forms in which death comes to the seals are also told—by starvation to the young if their mothers are killed before they are weaned, by the club of the hunter in the drives of bachelors, by cast of the spear to females sleeping on the water, and by old age if all other vicissitudes are safely passed. The story is told in language simple enough to be understood by the young, and it is meaty enough to be of interest to adults. The illustrations equal the text in volume and are not behind it in interest. There are over forty full-page plates from photographs and nearly as many small pen sketches in the text. President Jordan was appointed in 1896 chief of a commission from the United States to examine the seal fisheries of the Bering Sea in conjunction with similar commissions from Great Britain and from Canada. This book embodies a part of the information gathered during his first summer on and near the Pribilov Islands.

The beginner who has Prof. *Comstock's* book for a guide can hardly fail to become interested in entomology.† It gives the pupil plenty to do, it explains all difficult matters clearly, its style is animated, and it is further embellished by occasional poetical quotations. Observation in the field and on captive specimens in the schoolroom is the keynote of the book. The opening chapters are of general scope. The first describes the parts of an insect, the second tells how to collect and preserve specimens of each of the chief orders, while the third outlines the classification of insects and their near relatives. The second chapter does not contain all the directions for collecting. Further details on this subject and on the preservation and labeling of specimens, the breeding of insects, and on materials and reference books are given in another division of the volume occupying the last sixty pages. In the descriptive part insects are grouped under the heads of pond, brook, orchard, forest, and roadside life. Pupils are directed to collect eggs for hatching, and larvæ and pupæ to watch

* Matka and Kotik. By David Starr Jordan. San Francisco: The Whittaker and Ray Co. Pp. 69, 12mo.

† Insect Life. By John Henry Comstock. New York: D. Appleton and Company. Pp. 349, 12mo. Price, $2.50.

their transformations; also to observe the habits of free insects, and to make drawings of various parts. Two hundred and ninety-six cuts afford material aid in identifying species.

GENERAL NOTICES.

Some volumes* of what promises to be an unusually valuable series (even in this day of series) have recently come to us in the shape of two little histories—one of England and one of Germany. They are intended to give a brief general outline of the more salient and striking points in the history of each country, and are written so as to attract and appeal to children, with the hope that the interest thus stimulated by these mere outlines will lead the grown-up child to a perusal of the more extended and complete general historical accounts. The idea is a good one, and it seems to have been carried out fairly well in both of the present volumes.

The volume on England begins its story with the landing of Julius Cæsar. The state of things which he found and the changes brought about by the Roman conquest are discussed in the first chapter. The second chapter takes us to the Norman conquest. The chapters are divided up in this way all through the book, more stress being laid on the striking and important events from the standpoint of the whole people than on the lives of kings and the battles they fought. The growth of the Parliament and the several reform acts receive special attention.

German history is practically nothing but the story of a series of wars up to the time of the Reformation. This period is given about ninety pages in the present volume. Louis XIV and the War of the Spanish Succession are told about in the fifth chapter. The Seven Years' War and the fall of Germany during the Napeolonic epoch are next taken up; and finally there are two chapters—one on the German Confederation, and the last one on the modern German Empire as it stands to-day.

This notable work was projected by Dr. *von Tubeuf* to fill a gap in the literature relating to diseases of plants.* It deals with those diseases produced by the cryptogams and other lower organisms of the vegetable kingdom. The large number of parasites which attack such lower plants as algæ and lichens have, as a rule, been omitted. In the general part of the volume, comprising the first hundred pages, parasitism and the relations between parasite and host are discussed from a botanical standpoint. The subject of parasitism is immensely important on the economic side; for the ravages of scab and rust, of blight and smut, are world-wide and often grievous. Our author has not been indifferent to making his studies useful, but has summarized the preventive and combative agencies available against the more important diseases of economic plants. In the second or systematic part of the book the pathological phenomena are considered along with the description of the organism producing them. Notices of greater length are given to such parasites and diseases as have formed the subjects of special investigations. The list is intended to be complete for Germany and the neighboring countries, but includes also many species occurring only in other parts of the world, notably in America. Much valuable material has been made available to the author by the recent publication of several important works on the cryptogams. The three hundred and thirty illustrations are almost exclusively the author's own work, and a large part of them illustrate the habitus of pathological organisms. The English edition is more than a translation. It contains many additions by the author and by the editor, and the species of fungi that have been recorded for Britain and North America are indicated.

In a volume entitled *The Theory of Electricity and Magnetism* Dr. *Arthur G. Webster*,

* History for Young Readers. Germany, by Kate Freiligrath Kroeker. Pp. 251. England, by Francis E. Cooke. Pp. 358. Both, New York: D. Appleton and Company. Price, 60 cents each.

* Diseases of Plants induced by Cryptogamic Parasites. By Dr. Karl Freiherr von Tubeuf. English edition by William G. Smith, B. Sc., Ph. D. Longmans, Green & Co.: London, New York, and Bombay. Pp. 598, 8vo. Price, $5.50 *net*.

of Clark University, has endeavored to present the mathematics of the subject in a form more assimilable by the student than has been available heretofore (Macmillan, $3.50). Since graduates of American colleges are, as a rule, insufficiently prepared for taking up mathematical physics, the author has prefixed a mathematical introduction and a treatment of the Newtonian potential function to this work. For a similar reason he has included a treatment of the fundamental principles of mechanics. These matters occupy nearly half of the volume. Little or no reference has been made to experimental methods in electricity, these being left to other works. The general purpose of the treatise is to present the results of the electrical theory as it stands to-day, after the labors of Faraday, Maxwell, Helmholtz, Hertz, and Heaviside.

The *Bulletin of the Department of Labor* for May, 1897 (No. 10), contains a statistical report of one hundred and twelve pages on the Condition of the Negro in Various Cities. The investigation which furnished the data for this report was originally undertaken to ascertain the causes of the excessive mortality of negroes in Chattanooga, Savannah, and Boston. Afterward it was extended to seventeen Southern cities and the city of Cambridge, Mass., and besides statistics of sickness and mortality it has been made to embrace facts concerning sizes of families, number of rooms occupied, rents paid, sanitary condition of houses, occupations, earnings, and the number of defective, maimed, and deformed persons. The statistics do not cover the whole of the cities in which the investigation was made. A representative group of houses was taken in each, as the persons who gave their time to the work could not do more. This bulletin contains also a comparison of figures as to the work of men, women, and children for periods ten years apart, and miscellaneous minor articles.

Volume XXVIII, Part I, of the Harvard Observatory Annals is a catalogue of *Spectra of Bright Stars* discussed by *Antonia C. Maury*. The spectra of six hundred and eighty-one of the brightest stars north of declination — 30°, of which about forty-eight hundred photographs were obtained, are comprised in this catalogue. As the investigations were made several years ago, they could not take account of the recent discoveries respecting the spectrum of helium, but a discussion of the relation of the spectra of stars of the Orion type to that of helium is contained in supplementary notes. Volume XXXVI of the Annals completes the series of five volumes devoted to *Observations of Stars* by Prof. *William A. Rogers*. A list of errata for the whole series of volumes is included.

In the *Fifteenth Annual Report of the Bureau of Ethnology* the director, after describing the work of the year, proceeds to outline conclusions that have been reached by the bureau in regard to regimentation, the satisfaction of justice, and related matters in savage society. The chief of the accompanying papers is by William H. Holmes, on Stone Implements of the Potomac-Chesapeake Tidewater. Extensive deposits of rudely flaked stones are found in and about the city of Washington, and careful study of them has shown that they are on the sites of workshops connected with extensive quarries. From examinations of large quantities of rejectage it has been determined that the product of the flaking operations was a leaf-shaped blade. It was further ascertained that such leaf-shaped blades are to be found on Indian village sites in all parts of the surrounding country. Studies of quarries of other materials in the neighboring high land gave similar results, and in order to round out the subject all known classes of implements have been studied. These studies have not revealed the slightest evidence as to the occupancy of the region by any earlier people than the known Indian tribes. Jesse Walter Fewkes contributes a memoir on The Group of Tusayan Ceremonials called Katcinas, which is copiously illustrated with cuts and colored plates showing the masks and other paraphernalia used in these rites. There is a special report on The Repair of Casa Grande Ruin, by Cosmos Mindeleff, and other papers are The Siouan Indians, by W J McGee, and Siouan Sociology, by James O. Dorsey.

The work on *Stones for Building and Decoration*, by *George P. Merrill*, originally published in 1891, now appears in a revised and enlarged edition. Reading matter and

plates amounting to over fifty pages have been inserted here and there throughout the volume, and the whole book has been brought down to date. By these changes the author believes that its usefulness has been very materially increased.

The third volume, completing the college text-book of *Nichols* and *Franklin* on the *Elements of Physics*, has now been issued (Macmillan, $1.50 *net* a volume). About three fourths of the two hundred pages are devoted to light and the rest to sound. The calculation of the lengths and velocities of waves of light, of the positions of the foci of lenses and curved mirrors, and similar mathematical exercises in connection with diffraction, photometry, polarization, and radiation constitute the treatment of the former subject. There is more of description and less of mathematics in the chapters on sound, yet here the numerical values of wave motions and of intervals are made prominent. It may be well to repeat that the work, as a whole, is designed as an advanced text-book for colleges where an elementary course in calculus is taught, and whatever of demonstration, illustration, or discussion may seem needful to supplement the text should be supplied from the knowledge of each instructor using the book.

The varying prominence of the female element in religious conceptions is set forth in *The God Idea of the Ancients*, by *Eliza Burt Gamble* (Putnams). This is one of the lines of inquiry taken up by the author in preparing an earlier work on The Evolution of Woman, and her intention was to include its results in that work. In the separate volume in which the material has now been embodied she presents evidence to show that mankind construct their own gods and remodel them from the materials supplied by their own developing culture. She finds sex to have been the fundamental fact not only in the operations of Nature but in the construction of a god; that in an early age woman's influence was in the ascendency over that of man, and the religion of the time reflected the altruistic female character, but with the rise of male dominion the god idea took on egoistic qualities. Creative power is the keynote of many ancient religions, whether they take the form of tree, sun, fire, or lingam and yoni worship, and the chief god is represented as male or female, according as man or woman has been regarded as having the more important office in reproduction. The author examines a large number of the ancient religions, and points out the sexual significance of many of their emblems and ceremonies. In two chapters on Christianity a Continuation of Paganism she shows that some of these emblems and ceremonies have been inherited by the Christian religion. The book gives evidence of extended study; it is concisely written, and its statements are well fortified by quotations from authorities.

In *Lectures on Appendicitis* (Putnams) Dr. *Robert T. Morris* has given a general description of this disease, including symptoms, both general and local, and the method of treatment which his own experience has led him to believe the most satisfactory. The preparation of surgeon and patient is the subject of Chapter I. In Chapter II the appendix is described and pictured. Appendicitis, its symptoms and complications, is the subject of Chapter III, and finally in Chapter IV its surgical treatment is taken up. This comprises about half of the book. The remainder consists of a number of unrelated essays on such topics as the action of various solvents on gallstones, the drainage wick, and a last-resort hernia operation. Illustrations are freely used.

Water and Public Health, by *James H. Fuertes* (John Wiley & Sons, $1.50), is an attempt to make a comparative study of the mortality statistics of the principal cities of the world with reference to their water supplies. The undertaking is obviously a large one, and the annual mortality in a city is determined by so many different factors that a comparison based on water supply alone can not fail to be misleading. Notwithstanding this unavoidable incompleteness, however, the book contains some valuable suggestions.

The Development of the Frog's Egg, by *Thomas Hunt Morgan* (Macmillan, $1.60), is intended as an introduction to experimental embryology. Owing to the wide distribution and rather regular habits, despite its name, of *Rana temporaria*, its eggs are always easy to obtain; and as it has both tenacity of life and suitability for experimental purposes, it has

always been the mainstay of the elementary embryologist. Hence we know more about the processes and transformations by means of which its egg develops than we do about these same occurrences in any other egg; and, as it is believed that the process which goes on in one egg is, in a general way, a counterpart of that which goes on in all other eggs, we can, by studying the development of the frog's egg, get a fairly good idea of the embryology of all the other animals hatched from eggs. This book is a careful microscopic following of the process of development in a frog's egg from the time when the egg is forming to the moment when the young tadpole issues from the jelly membranes. Especial weight, however, is laid on the results of experimental work, tending to modify in various ways the normal process. Illustrations are used wherever they tend to simplify the text.

An essay on *The Psychical Correlation of Religious Emotion and Sexual Desire* has been published by Dr. *James Weir, Jr.*, in a tastefully got up pamphlet. He shows the connection between erato-mania and religious mania by facts drawn from Greek and Roman history, the history of celibate religious orders, and various anthropological investigations. The author believes that upon this correlation depends, in a great measure, the stability of sexual morality. (The author, Owensboro, Ky.)

Art Education, the True Industrial Education, by *W. T. Harris* (second edition, Bardeen, 50 cents), is an address delivered before the National Educational Association at the meeting in Nashville in 1889. Dr. Harris contends that "æsthetic education—the cultivation of taste, the acquirement of knowledge on the subject of the origin of the idea of beauty (both its historic origin and the philosophical account of its source in human nature), the practice of producing the outlines of the beautiful by the arts of drawing, painting, and modeling, the criticism of works of art —all these things we must claim form the true foundation of the highest success in the industries of any modern nation." Dr. Harris, with his well-known clear and incisive reasoning, supports this thesis through twenty-two pages.

PUBLICATIONS RECEIVED.

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Fragments of Science.

Birds and Farm Pests.—Mr. F. E. L. Beal, in a paper on Some Common Birds in their Relation to Agriculture, observes that whether a bird is injurious or beneficial depends almost entirely on what it eats. If crows or blackbirds are seen in numbers about cornfields, or if woodpeckers are noticed at work in an orchard, it is perhaps not surprising that they are accused of doing harm. Careful investigation, however, often shows that they are actually destroying noxious insects, and also that even those which do harm at one season may compensate for it by eating noxious species at another. Insects are eaten at all times by the majority of land birds, and during the breeding season most kinds subsist largely and rear their young exclusively on this food. When insects are unusually plentiful they are eaten by many birds which ordinarily do not touch them. Within certain limits birds feed upon the kind of food that is most accessible. Thus, as a rule, insectivorous birds eat the insects that are most easily obtained, provided they do not have some peculiarly disagreeable property. It is not probable that a bird habitually passes by one kind of insect to look for another that is more appetizing, and there seems little evidence in support of the theory that the selection of food is restricted to any particular species of insect, for it is evident that a bird eats those which by its own method of seeking are most easily obtained. Thus, a ground-feeding bird eats those it finds among the dead leaves and grass; a flycatcher captures en-

tirely different kinds; and the woodpecker and warbler in the tree tops select still others. The practical value of birds in controlling insect pests should be more generally recognized. It may be an easy matter to exterminate the birds in an orchard or grain field, but it is an extremely difficult one to control the insect pests. It is certain, too, that the value of our native sparrows as weed destroyers is not appreciated. Weed seed forms an important item of the winter food of many of these birds, and it is impossible to estimate the immense numbers of noxious weeds which are thus annually destroyed. If birds are protected and encouraged to nest about the farm and garden, they will do their share in destroying noxious insects and weeds; and a few hours spent in putting up boxes for bluebirds, martins, and wrens will prove a good investment.

Kites and Balloons in Meteorology.—The recent development of the kite for meteorological purposes, Mr. A. Lawrence Roche says in his paper on the subject, has taken place in the United States, while the use of automatic balloons for obtaining data at very great altitudes has hitherto been confined to Europe. Kites appear to have been first applied in meteorology by Alexander Wilson in Glasgow, who in 1749 raised thermometers attached to them into the clouds. Next was Franklin's electrical experiment. Between 1883 and 1885 E. D. Archibald made differential measurements of wind velocity by anemometers raised on kites fifteen hundred feet. In 1885 A. McAdie repeated Franklin's experiment on Blue Hill; and he afterward made other electrical experiments with kites. The invention of light-weight self-recording instruments made it possible to obtain graphic records in the air by means of kites; and the introduction of tailless kites by Mr. Eddy added to their usefulness. The thermograph raised by S. P. Ferguson, of Blue Hill, in August, 1894, was no doubt the first instrument recording continuously and graphically to be raised by kites; and it permitted simultaneous observations to be obtained in the free air and near the ground. This method of studying the meteorological conditions of the free air has ever since been in regular use at the Blue Hill Observatory. Probably the greatest elevation yet attained by kites, and certainly the highest level to which kites have lifted a meteorograph, is 8,740 feet above Blue Hill. This was accomplished October 8, 1896, by the aid of nine kites, having a total area of 170 square feet, which gave a maximum pull at the ground of about a hundred pounds. The meteorograph remained during several hours higher than a mile, and good records of the indications of the barometer, thermometer, and hygrometer were brought down. More than one hundred records of atmospheric pressure, temperature, and relative humidity of the air, or wind velocity at intermediate heights up to the extreme altitude mentioned have been obtained. Kites furnish a ready and accurate method of measuring the heights of certain low and uniform clouds. Changes of wind direction in the different air strata are determined from the azimuths of the kites. To reach much higher altitudes than three miles unmanned free balloons have been considerably used in France and Germany. These balloons, which carry self-recording apparatus, rise until equilibrium is attained in the rarefied air, when they lose their buoyancy and fall to the earth. Most of them have been recovered, with the instruments and records uninjured.

The Education of an Engineer.—Criticising the present methods of education, especially for qualifying students in mechanical science, Mr. G. F. Deacon asked, in his British Association sectional address, "Are we not in some cases attempting, at too early a stage, the teaching of subjects instead of principles? I mean including the practical working of details which will become the regular work of the student in the office or works of an engineer. . . . I do not say that subject training of this kind at college may not be useful; but we have to consider whether it does not, for the sake of some little anticipation of his office work, divert the attention of the student from the better mastery of those principles which it is so essential for him to grasp at the earliest possible time, and which do not limit his choice in the battle of life to any branch whatever of the profession or business of an engineer, but which, on the contrary, qualify him better to pursue with success whatever branches his inclination or his opportunities

or his means may suggest." The author pointed out as a danger in the usual limitations of compulsory subjects for examinations for certificates and degrees, that in view of them subjects not made compulsory may be neglected, however important to the engineer they may be; and he recommends that a certain very moderate standard in all such subjects should be made compulsory if a certificate of proficiency is to be given in engineering or physical science.

History of Color Photography.—In a recent lecture before the Oxford University Junior Scientific Club, Captain W. de W. Abney gave a very good account of the present state and history of color photography. The first process described was that based on the three-color negatives—three negatives being taken, one through an orange, one through a green, and one through a blue screen. These negatives are developed in the ordinary way, and then viewed through three superposed color screens corresponding with those through which the negatives were taken. This process produces very beautiful results, but is obviously limited in application and is not true color photography. The next process described was that of Dr. Joly, of Dublin, who, basing his work on the same theory of color vision as the preceding, reproduces in color by means of a single negative. The human eye is incapable of separating points or lines which lie very close to one another. Dr. Joly's method utilizes this fact by ruling on a transparent screen lines only one two-hundredth of an inch broad, and very close together, and coloring them alternately red, green, and blue. The negative is taken through this screen, and then developed and viewed through a similarly colored screen, when the picture appears in approximately its natural colors. The viewing differ from the taking screens in both of these processes. The taking screens must not be such as to allow only monochromatic light to pass, but must allow a certain amount of overlapping. The viewing, on the contrary, are made as monochromatic as possible. Instead of using transparencies and colored films, transparent inks may be used to produce pictures by three printings. The oldest process described is that of the production of color by the action of light itself, or the true color photography. Somewhere about 1847 Becquerel found that if, instead of iodizing a plate, he chlorinized it and then exposed it to white light, it gradually assumed a violet tint; and if in this state he exposed it to the spectrum, he was able to obtain the colors of the spectrum on it. Unfortunately, however, these colors were not permanent, and no method has been devised for fixing them. The last method described by Captain Abney was that of Lippmann, who found that if by means of reflection he obtained stationary waves in the film, on development the silver was deposited between the nodes. On reflecting light from such a "noded" plate the proper light alone was reflected, and the photograph, viewed at a particular angle, appeared in its natural colors. If looked at by transmitted light these photographs have merely the appearance of ordinary transparencies. This method is known as the interference method, because the stationary waves which produce the nodes on the plate are caused by the interference of the normal light vibrations.

Distribution of Species by Man.—The Spread of Species by the Agency of Man was the subject of Chairman L. O. Howard's address before the Botanical Section of the American Association. The author showed that while natural spread had been the rule for centuries, the agency of man has become preponderating with the improvement of commercial intercourse between nations. In the intentional introduction of useful plants and flowering plants from foreign countries species sometimes escape from cultivation and become weeds. The intentional introduction of wild animals has generally been disastrous, as those of the mongoose in Jamaica and Australian flying foxes in California. Accidental introductions have been more powerful in extending the range of species and in changing the character of the plants and animals of a given region than intentional introductions. The era of accidental importations began with the beginning of commerce, and has grown with the growth of commerce. The vast extensions of international trade of recent years, every improvement in rapidity of travel and in safety of carriage of goods of all kinds have increased the opportunities of addi-

tional introductions, until at the present time there is hardly a civilized country which has not firmly established and flourishing within its territory hundreds of species of animals and plants of foreign origin, the time and means of introduction of many of which can not be exactly traced, while of others even the original home can not be ascertained. The paper closed with a suggestion that much may be accomplished by wisely planned and guarded introductions, as in the case of the Australian ladybirds introduced into California and the Sandwich Islands through Albert Kaebele.

Fields for Exploration in South America.—Mr. J. Scott Keltie showed in his geographical address at the British Association that there is a wider and richer field for exploration in South America than in any other continent—even than in central Africa. Along the great river courses our knowledge is fairly satisfactory, but the immense areas, often densely clad with forests, lying between the rivers, are almost unknown. In Patagonia, a great deal has recently been done by the Argentine Government; still, in the country between Punta Arenas and the Rio Negro we have much to learn; while on the west coast range, with its innumerable fiordlike inlets, its islands, and peninsulas, there is a fine field for the geologist and the physical geographer. Indeed, throughout the whole range of the southern Andes, systematic exploration is wanted. There is an enormous area lying to the east of the northern Andes, and comprehending their eastern slopes, embracing the eastern half of Ecuador and Colombia, southern Venezuela, and much of the country lying between that and northern Venezuela, including many of the upper tributaries of the Amazon and Orinoco, of which our knowledge is of the scantiest. Even the country lying between the Rio Negro and the Atlantic is but little known. There are other great areas, in Brazil and in the northern Chaco, which have been only partially described. A survey and detailed geographical and topographical description of the whole basin of Lake Titicaca is a desideratum.

Screw Propellers and Cavitation.—In a paper recently read at the International Congress of Naval Architects and Marine Engineers, by Mr. S. W. Barnaby, we find some interesting data on the above subject. Several years ago the author, in conjunction with Mr. Thornycroft, observed and described this phenomenon of cavitation at high speeds, and suggested that the speed of vessels was approaching a point at which propulsion by screws would become less efficient. If a cavity be formed in any manner in the interior of a mass of water it will tend to become filled with water vapor and with any air which may be in solution, since ebullition takes place at ordinary temperatures in a vacuum. The method used thus far for overcoming this tendency is an increase of propeller-blade surface; in one instance, by increasing the surface forty-five per cent without materially changing the diameter or pitch of the propeller, the same speed (twenty-four knots) was obtained with six hundred and fifty less horse power, and with a decrease of slip to seventeen and a half per cent instead of thirty per cent. The number of revolutions required for twenty-four knots with the screws of small area sufficed to drive the vessel at 28·4 knots when the blade area was increased. The vibration was extreme and dangerous with the narrow blades, but was of a quite normal and unimportant character when the blades were widened. Mr. Barnaby thinks that cavitation will be a source of much trouble in the future. Already it is becoming difficult to obtain the requisite area in screws of "destroyers" without either resorting to an abnormal width of blade or to a larger diameter and pitch ratio than would otherwise be preferable. The one expedient gives undue surface friction, and the other necessitates a reduction in the rate of revolution, and therefore a heavier engine.

Pure and Commercial Science.—It should hardly need saying, as Prof. H. Marshall Ward observes in his British Association sectional address, that the fact that a scientific discovery is found to have a commercial value is no argument against the scientific value of the research; yet some are disposed to depreciate research that may advance economical ends. There are in agriculture, forestry, and commerce generally, Prof. Ward continues, "innumerable and important questions for solution, the investigation of which

will need all the powers of careful observation and industrious recording of which a scientific man is capable. But while I emphatically regard these and similar problems as worthy the attention of botanists, and recognize frankly their commercial importance, I want carefully and distinctly to warn all my hearers against supposing that their solution should be attempted simply because they have a commercial value. It is because they are so full of promise as scientific problems that I think it no valid argument against their importance to theoretical science that they have been suggested in practice. In all these matters it seems to me we should recognize that practical men are doing us a service in setting questions, because they set them definitely. In the attempt to solve these problems we may be sure science will gain, and if commerce gains also, so much the better for commerce and indefinitely for us. But that is not the same thing as directly interesting ourselves in the commercial value of the answer. This is not our function, and our advice and researches are more valuable to commerce the less we are concerned with it."

Some New Facts regarding Yeast.—Some interesting experiments have been under way during the past few years regarding the phenomena of fermentation. It has been generally thought that the alcoholic fermentation of sugar by yeast differs from the ordinary hydrolytic processes of the enzymes in that the actual presence of the living yeast cell was an essential. Some investigators have doubted this, however, and have thought that alcoholic fermentation was simply an example of ordinary enzyme action of special complexity. These views were partially supported by some experiments of Dr. E. Buchner, announced in the early spring; and it is now reported that later experiments from the same laboratory still further confirm this view, and, in fact, make it almost a certainty. Dr. Buchner, by pounding up pure yeast with quartz sand and adding a certain amount of water, was able to squeeze out under a pressure of from four hundred to five hundred atmospheres a liquid which, after thorough filtering, was of an opalescent appearance and possessed an agreeable yeastlike odor. All care was taken to exclude any organism from the liquid, and it was found that under these conditions it was able to excite alcoholic fermentation in solutions of suitable sugars. The addition of chloroform, even up to the saturation point, does not inhibit the fermentative process, and this, in conjunction with the fact that the activity of the solution is not affected by the presence of the ordinary antiseptic substances, and that the solid residue, after evaporation at low temperatures, is found to yield an active solution even after being kept for two or three weeks, seems to show conclusively that the fermentation in these cases is not brought about by living protoplasm in any form, but is really due to an enzyme ferment which the author calls zymase. This is further confirmed by the fact that dried yeast heated to 100° for six hours, while incapable of further development, still yields an active solution when treated with a sterilized thirty-seven-per-cent sugar solution.

Thirteen Years' Progress in Physiology.—The presidential address of Prof. Michael Foster in the Physiological Section of the British Association was devoted to a review of the progress of physiology during the thirteen years since the association previously met in Canada, and dealt largely in technicalities. The progress consists partly of the continuation of investigations previously begun, and of advance in investigations newly entered upon. An example of the former kind is the study of the mechanics of the circulation. The researches of Hürthle and Tigerstedt, of Roy and Adami, and others have left us wiser on this subject than before. So real, if not exciting, progress has been made with the problems of muscular contraction; we are some steps measurably nearer an understanding of what is the nature of the fundamental changes that bring about contraction, and what are the relations in the changes in the structure of muscular fiber. In respect to the beat of the heart, we have continued to approach nearer to the full light. Among other problems concerning which knowledge has advanced are those of the nature of secretion and of transudation, concerning which controversies have raged that have not been wholly unprofitable. Included in the new subjects of research are physiological chemistry in gen-

eral, the nature and office of the secretions, the nervous system, and the workings of the brain—concerning which, "if increasing knowledge gives us increasing power so to mold a muscular fiber that it shall play to the best the part which it has to play in life, the little knowledge we at present possess gives us at least as much confidence in a coming far greater power over the nerve cell."

The Tilting of the Lake Region.—The discussion of the geological history and future of the region of the Great Lakes was again brought up in the American Association by Dr. W. J. Spencer, who, after reviewing his investigations in former years of the ancient outlets of Lake Erie, spoke of the lake region as having been covered subsequently to the Glacial period by great bodies of water all at one level. One of these, Warren Gulf, which covered the lake basins, was broken up by the rise of the land, and Lakes Superior, Huron, and Michigan were formed, their water emptying to the northeastward and not into the Erie basin. Afterward the land rose higher to the northeastward, filled the rivers of the basins upward, and turned the upper lakes into Lake Erie. At the same time the rocky barriers caused Lake Erie to drown the western hundred miles of its basin, and the waters are now rising and will in a few centuries cover Toledo and Detroit. The evidence is recorded in the shore lines, which have been surveyed by Professor Gilbert, the author, and others. They have risen in some cases from four to seven feet per mile going northeastward in a period of about fifty years. Prof. G. K. Gilbert in another paper presented a comparison of surveys made on the lake shores twenty or more years ago and within the past year. It is found that changes have taken place, all of which show a rising of the land at the north or northeast as compared with the land at the south or southwest. The whole lake region appears to be undergoing a tilting toward the south southwest at such a rate that of two points a hundred miles apart, the northern rises five inches in a century as compared with the southern. The mean level of the lake rises at Chicago about an inch in ten years, or ten inches in a century. It is estimated that in about three thousand years all the overflow from the upper lakes will go to the Illinois. The Detroit and St. Clair Rivers will carry water from Lake Erie to Lake Huron instead of from Huron to Erie, and the Niagara River will run dry.

Canada's Oldest Geology.—The presidential address of Dr. D. M. Dawson before the Geological Section of the British Association comprised a comprehensive but highly technical account of the Pre-Cambrian Rocks of Canada. At the close of his review the author said that the general tendency of our advance in knowledge appears to be in the direction of extending the range of the Palæozoic downward, whether under the old name Cambrian or under some other name applied to a new system defined, or likely to be defined, by a characteristic fauna. The somewhat arbitrary and artificial definition of the Olenellus zone as the base of the Cambrian seems to be not of world-wide application, and not even generally appropriate to North America; while as a base for the Palæozoic eon it is of still more doubtful value. In the Cambrian period as well as in much later geological times the American continent does not admit of treatment as a single province, but is to be regarded rather as a continental barrier between two great oceanic depressions, each more or less completely different and self-contained in conditions and history—that of the Atlantic and that of the Pacific. On the Atlantic side the Olenellus zone is a fairly well-marked base for the Cambrian; on that of the Pacific it is found naturally to succeed a great consecutive and conformable series of sediments, of which the more ancient fauna is now only beginning to be known.

The Thumb and Toes in Men and Apes.—The presidential address of Sir William Turner before the Anthropological Section of the British Association was devoted to some of the characteristics of human structure distinguishing it from that of the apes. Its language is largely technical. The description of the differences in the disposition of the thumb and of the toes presents many points of interest. Both in man and the ape the thumb is not tied to the index digit by an intermediate ligament, which, under the

name of "transverse metacarpal," binds all the fingers together and restricts their separation from each other in the transverse plane of the hand. The great toe of the ape is similarly not tied to the second toe as the other toes are tied to one another and restrained in their movements. The hallux of the ape is therefore set free, and can, like the thumb, be thrown into opposition and be used as a prehensile digit. In the human foot the hallux is tied to the second toe by a continuation of the same transverse metatarsal ligament that ties the smaller toes together. Hence it is impossible to oppose the great toe to the surface of the sole in the way in which the thumb can be used, and the movements of the digits in the transverse plane of the foot are also greatly restricted. In the hand of both man and the ape the joint between the metacarpal bone of the thumb and the bone of the wrist is concavo-convex, or saddle-shaped, and permits of a considerable range of movements in certain directions, and notably of the movement of opposition. In the foot of man the joint is not thus shaped, and the range of movement is slight. One of the chief factors in the production of the movement of opposition is a special muscle, the *opponens pollicis*, which is so adjusted as to draw the entire digit over the surface of the palm. In the foot of the anthropoid apes there is not complete correspondence among the different species in the similar disposition for moving the great toe, and in some it is altogether absent, as it is in the foot of man.

MINOR PARAGRAPHS.

THE excitement over the discoveries of gold in the Klondike has caused attention to be directed again to the search for the precious metal. Long neglected deposits are re-examined, the gravels of farms are inspected, and bits of sparkling yellow dirt are collected, to have it determined whether there may not be real gold in them. The officers of the mint in Philadelphia are kept busy testing the specimens sent to them. Hardly a day passes, we are told, that the assayers are not called upon for this purpose, and samples of supposed gold and silver quartz and of sand come into the mint by mail and by express. These specimens include every variety of shining rock and dust —pyrites, mica, talc, common sand, and rock sprinkled with crystals; and along with them often come letters which suggest how bitter will be the disappointment of the senders when they learn that the precious stuff from which they anticipate so much is only "fool's gold." They might learn the real nature of their treasure nearer home, but no jeweler's or metal worker's reply will do for them. Nothing but what they consider the highest expert authority will satisfy them.

THE investigations by Prof. Wesley Mills of the psychic development of the rabbit and the cavy or guinea-pig are interpreted by him as illustrating sharp contrasts at birth and for some time after in animals that in mature life have much physically and psychically in common. The cavy soon after birth is able to care for itself and can maintain an independent existence. The rabbit at birth is blind, deaf, incapable of any considerable locomotive power, and is, generally speaking, in a perfectly helpless condition; but it attains comparative maturity in a month. So simple is the psychic life of both animals that there is little to note in them by way of advance after they are a few weeks old. After the first month of existence comparison with the dog, cat, and allied creatures ceases to be suggestive. The rodents are quite left behind. They seem capable of little education from man or Nature.

IN describing, in the American Association, the Features of Recent Geology around Detroit, Prof. Frank B. Taylor ascribed the extreme flatness of the country mainly to the fact that it was for a long time the bottom of a lake. As the ice sheet retreated northward in the Detroit Valley and northeastward on Lake Erie, it blocked the escape of the water, and a great lake was formed in front of the ice, covering all the Detroit region and all the lowlands around the western end of Lake Erie. A terminal moraine crosses the Detroit River in the vicinity of Detroit and Trenton, but it was laid down in deep water and is not a prominent feature. For a considerable

time the water of this glacial lake was nearly two hundred feet deep over the present site of Detroit. The lake covered all the area of Lake Erie and the low border lands, part of the west end of Lake Ontario, and the southern half of Lake Huron. Its outlet was westward from Saginaw Bay across Michigan through the valley of the Grand River to Lake Chicago (filling the southern part of Lake Michigan), and thence by the Chicago outlet to the Mississippi River. The subsequent history of the lake, as disclosed by the geology, is sketched in the paper.

In a paper read to the American Association upon the scale insects which secrete wax, Dr. L. O. Howard showed that although industries of considerable importance have been derived from the secretions of such insects in Oriental regions, nothing of the kind has so far been done in America. Yet several species exist in the Southwestern States which might possibly be of commercial value. Thus a bark louse is found upon three species of oak in southern California, in practically unlimited supply. A partial chemical investigation has shown that while a very excellent wax may be dissolved by means of chloroform from the insect mass, an insoluble residue remains which has a general resemblance in physical properties to India rubber.

Of the difficulties attending the use of expert testimony in court, Chairman Galbraith, of the Section of Chemistry in the American Association, said that "we are now possessed of so very little of that which may one day be known, that no true scientist hesitates to plead legitimate ignorance, but what really troubles us upon cross-examination is that the court does not speak our language, a language often difficult of direct translation; and the fact that it is but rarely schooled in the principles of our science, and, in consequence, frequently insists upon categorical answers to the most impossible kind of questions." When the expert's testimony has been muddled in this way in the cross-examination, the confusion can not be remedied on the redirect examination, because of the lack of familiarity of the friendly attorney with the subject. This leaves the witness in the position of seemingly disagreeing with his own testimony. As a remedy for this the author favored an appeal to the court, urging that the oath requires the whole truth and not a misleading portion of it. In order to secure clearness the expert should avoid technicalities as much as possible.

NOTES.

Of the twelve hundred and six species of the animal kingdom which have been represented in the Zoölogical Gardens of Philadelphia up to the present time, one hundred and four have bred. The propagation of some of our native animals, which are becoming scarce in a wild state, has been conducted with a fair measure of success. This is notably the case with the American bison. Sixteen individuals are now in the gardens, nine of which are females; and all have been bred there except two, which were obtained in exchange for those of the garden's breeding, in order to infuse a new strain into the herd.

The chapter of Dr. White's Warfare of Science with Theology, From Demoniacal Possession to Insanity, is the subject of a friendly and appreciative review by Dr. Warren L. Babcock in the American Journal of Insanity.

A Canadian dog story in the London Spectator tells of a little cocker-spaniel dog which was accidentally left by its mistress at a house she visited about a mile from her home. He could not be made to go away till he was taken to the telephone and the trumpet was applied to his ear. Then his mistress called from her house, "Come home at once, Paddy." "Immediately he wriggled out of the boy's arms, rushed at the door, barking to get out, and shortly afterward arrived panting at the rectory."

It is announced by V. H. Veley and L. J. Veley, in Nature of July 1st, that they have found in shipments of rum from Demerara a micro-organism belonging to the group *Coccaceæ*, which they regard as a new species. The organism was found as chains of small cocci in the sediment from specimens of barreled rum which had been returned as 42 per cent over proof, equivalent to 74·6 per cent alcohol by weight.

It is generally said that the American Indians at the time of discovery did not use anywhere on the continent a stringed instrument. Dr. D. G. Brinton has, however, found four examples which seem to controvert this, and has described them in a brief paper in The American Antiquarian. One is the *quijongo* of Central America, a monochord with a gourd or jar as resonator. The "Apache fiddle," specimens of which are in the Museum of the University of Pennsylvania, is an instrument of one cord, with a hollow reed as resonator. A third instrument is mentioned by James Adair, in his

History of the American Indians, as having eight strings. The fourth is shown in the Metropolitan Museum, as from Brazil. It has four strings, with a reed and jar. These instruments may be borrowed, but the possibility of their being native and original is sufficient to justify investigation.

THE most important action taken by the council and committees of the British Association during the past year was in the direction of impressing upon the Imperial Government the necessity of establishing a national laboratory of physical research and a bureau of ethnology for Greater Britain. It was felt that the nation does not contribute to physical research to the extent that the benefits derived from the inventions of students of physics warrant, and negotiations are in progress in regard to the matter. The proposed establishment of a bureau of ethnology is expected to be of use to officers performing administrative work, and to missionaries seeking preliminary knowledge of the characteristics of the peoples among whom they are to labor.

THE considerable proportion of young men attending the Toronto meeting of the British Association was remarked in the Globe of that city.

IT is regarded as probable by Dr. D. G. Brinton that some valuable writings of earlier students of Mayan antiquities may still exist in the old libraries of Spain or Italy or in private collections of ancient convents. There have already been some accidental findings, as that of Landa's manuscript by Brasseur de Bourbourg, that of another work by Señor Marimon, and that of the *Codex Peresianus* by De Rosny in a waste basket. But if one knows what to look for, the probabilities of success will be greater. Dr. Brinton, therefore, in his papar mentions authors and titles of works that we know were written previous to the present century on the rites, customs, religions, and antiquity of Mayas, the present whereabouts of which are unknown. The list proves that the early missionaries did not always neglect the pagan rites and histories, and that if we had their manuscripts complete, our knowledge of Mayan antiquities would be greatly enlarged.

WHILE the pioneer work of exploration has been to a great extent accomplished in Africa, and the lines have been run in all directions, Mr. Scott Keltie speaks of the broad meshes between these lines as still needing to be filled in; and one or two regions yet remain that afford scope for the adventurous pioneer. One region of considerable extent, still practically unknown, is south of Abyssinia, and west and northwest of Lake Rudolf, on to the upper Nile. Another extensive area is in the western Sahara. All over the continent are regions that will repay special investigation. Even in northern Africa, an English traveler, Mr. Cowper, has found, not far from the Tripoli coast, miles of magnificent ruins, and much to correct on our maps; and but little is known of the interior of Morocco and the Atlas Mountains.

COMMITTEES were appointed at the recent Detroit meeting of the American Association to secure uniform nomenclature in the scientific terms used in commerce; and to consider means for extending the influence of the association into the secondary schools.

THE vice-president's address of Prof. William Ramsay before the Section of Chemistry in the British Association was devoted to an exposition of his reasons, founded on the atomic relations and behavior of argon and helium, for supposing the existence of another gas not as yet discovered.

THE saguaro cactus of Arizona was described by Mr. Henry G. Hubbard to the Society of Economic Entomologists at Detroit as containing a woodlike fiber, allowing it to resist the most violent winds as solidly as an oak tree. The plants are sometimes sixty feet high, and are of great economic importance, serving in the desert for timber. The Indians use the fiber for roofing, laths, etc., in building their huts.

THE Essex Field Club, England, has been considering methods for protecting the native fauna and flora from the destruction and even extermination with which some species are threatened; and at a recent meeting unanimously adopted a resolution to all lovers of Nature to avoid the danger—(1) by abstaining from wholesale collecting, from collecting for merely individual purposes, from needless rooting up of specimens, from attempting to cultivate wild specimens of refractory species, and from purchasing such wild specimens from dealers; and (2) by endeavoring to persuade others, especially school children, cottage gardeners, and dwellers in large towns, to similar abstention. The need of these precautions is as great in the United States as in England.

A NOTE in Nature from Kumagusu Minakata gives a curious Japanese method of obtaining information regarding the future. "Noma Sanvanoshin narrated that the destiny of a belligerent could well be foretold by means of the 'Tanishi' (common black land snails, gathered for food in muddy rice fields). If two groups consisting each of three of these shellfish be placed in opposite corners of a tray, the three animals representing the future conquerors would advance, while the others which are doomed to defeat would withdraw. This method was approved by repeated experiments during the siege of Osaka (1615)."

THE Hon. Ralph Abercromby, author of some excellent works on meteorology, died at Sydney, New South Wales, June 21st, fifty-four years of age.

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